UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. 55 JANUARY, 1929 No. 311

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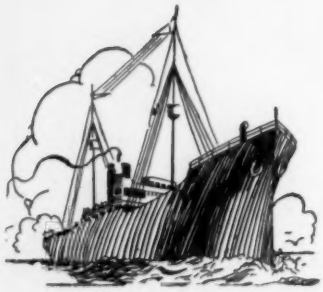

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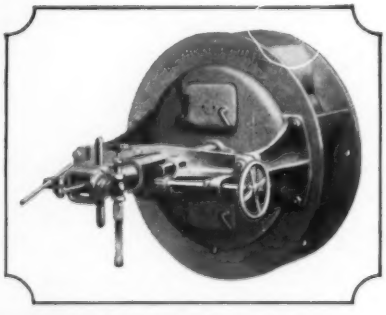

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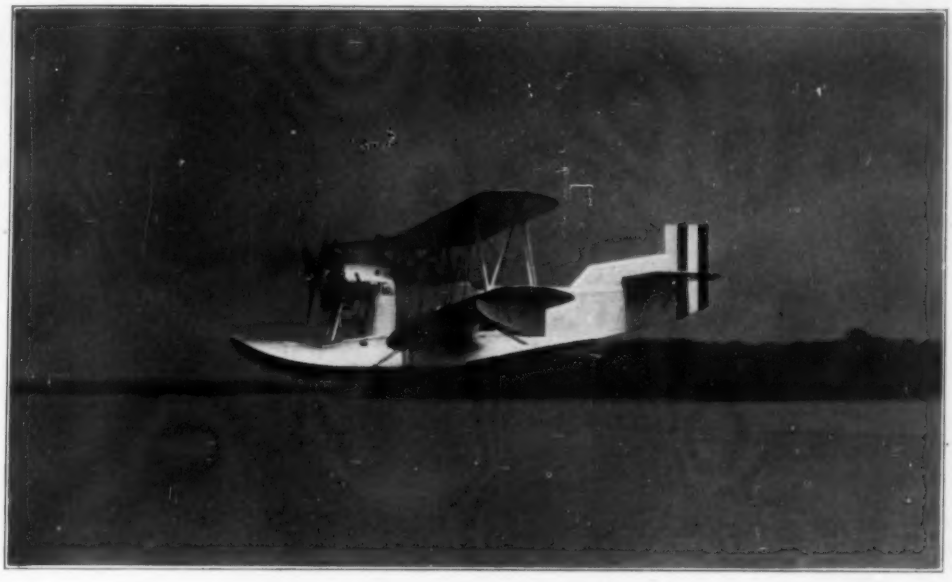

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U.S.S. *MARYLAND*

The superdreadnought *Maryland* selected to take President-elect Hoover upon his visit of friendship to South America. Photograph was taken through a porthole glass 1½ inches thick, from the U.S.S. *Tennessee* by Lieutenant Commander La Gorce.

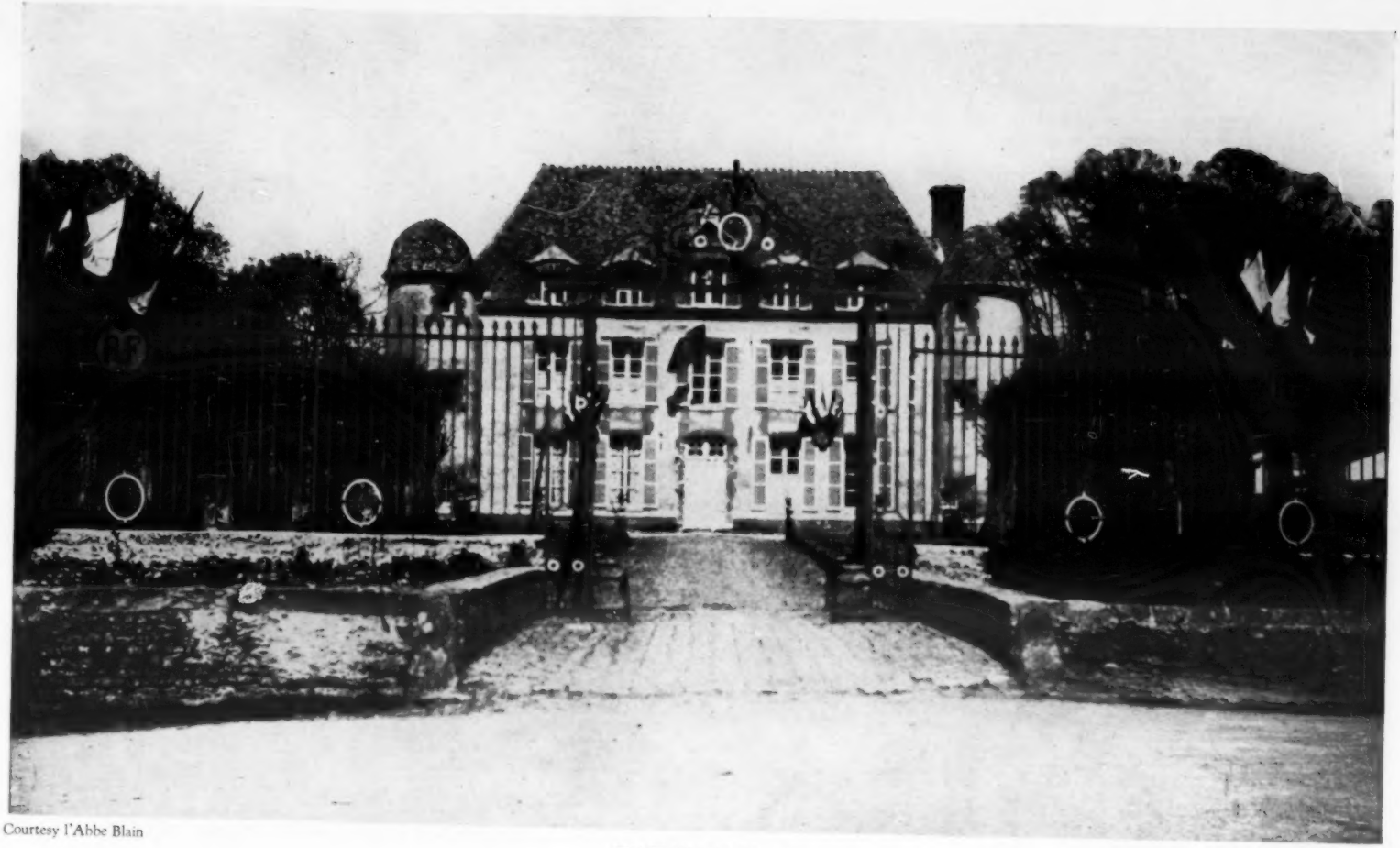
International Newsreel

THE NAVY AND JOHN PAUL JONES

As part of the Navy Day exercises a wreath was placed on the statue of John Paul Jones in the Mall, Washington, D.C.

Courtesy Commander A. H. Miles, U.S. Navy

Reproduced from a water color made in London, 1782, while De Grasse was a prisoner.



Courtesy l'Abbe Blain

CHATEAU DE GRASSE
Tilly, France

Courtesy Commander A. H. Miles, U.S. Navy

SIEGE OF YORKTOWN, 1781
Simion Fort

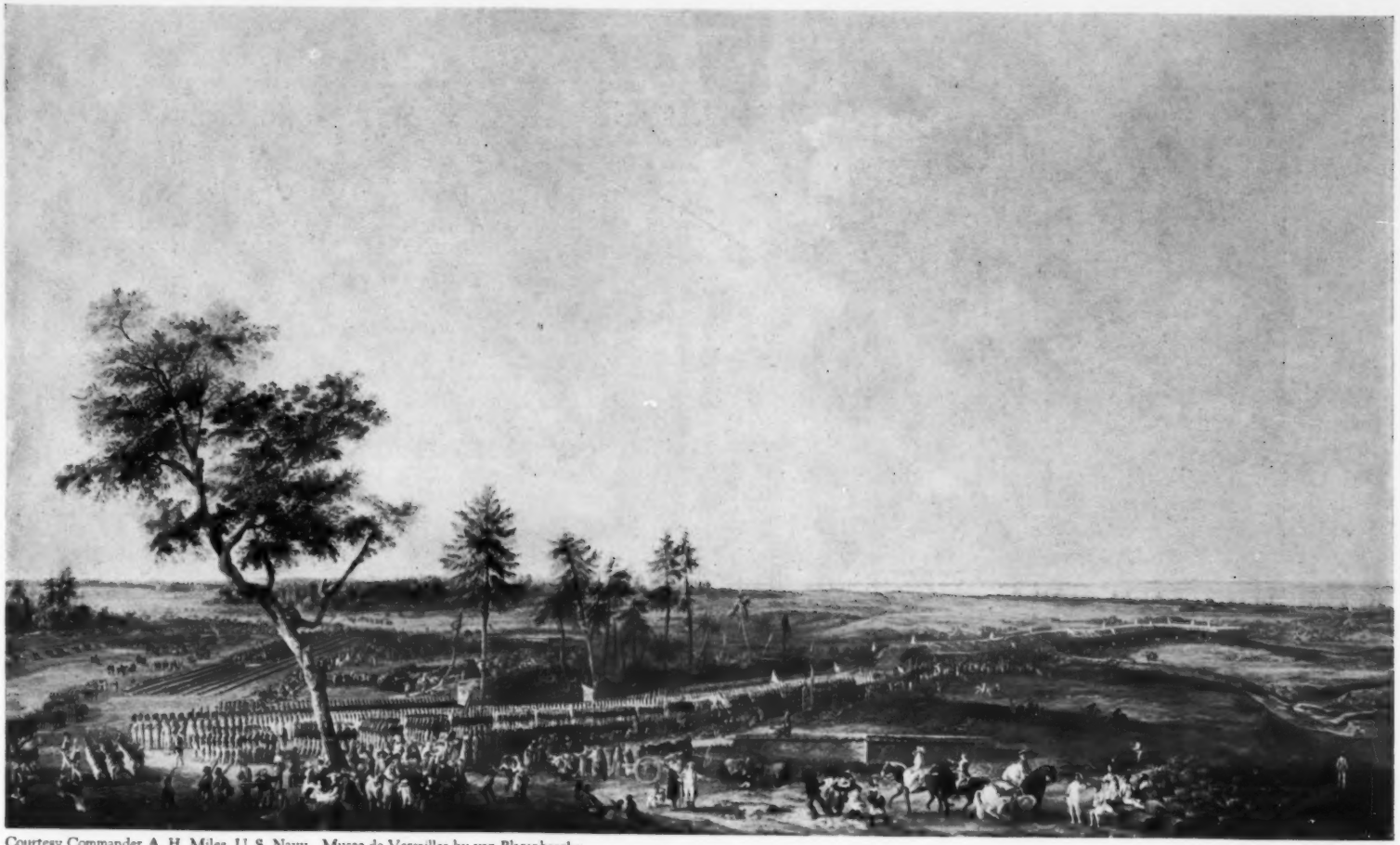
Courtesy Commander A. H. Miles, U. S. Navy. Musee de Versailles by van Blarenberghe

SIEGE OF YORKTOWN, 1781
First and second parallels.

Courtesy Commander A. H. Miles, U. S. Navy. Musze de Versailles by A. Couder

SIEGE OF YORKTOWN, 1781

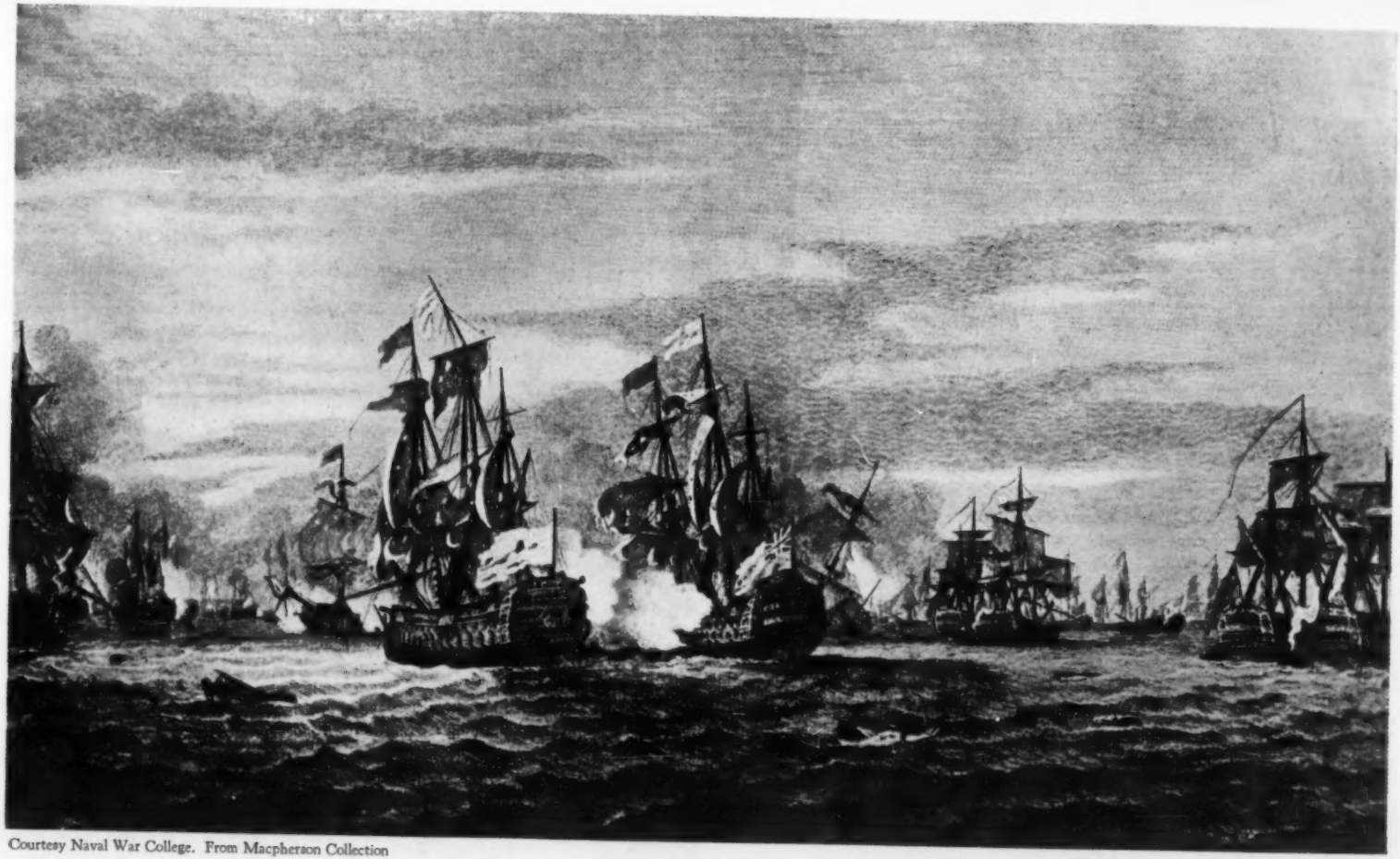
Rochambeau and Washington giving orders for the assault. Lafayette is standing by Washington.



Courtesy Commander A. H. Miles, U. S. Navy. Musee de Versailles by van Blarenberghe

CAPTURE OF YORKTOWN, OCTOBER 19, 1781

The British garrison laying down arms before the American and French troops.



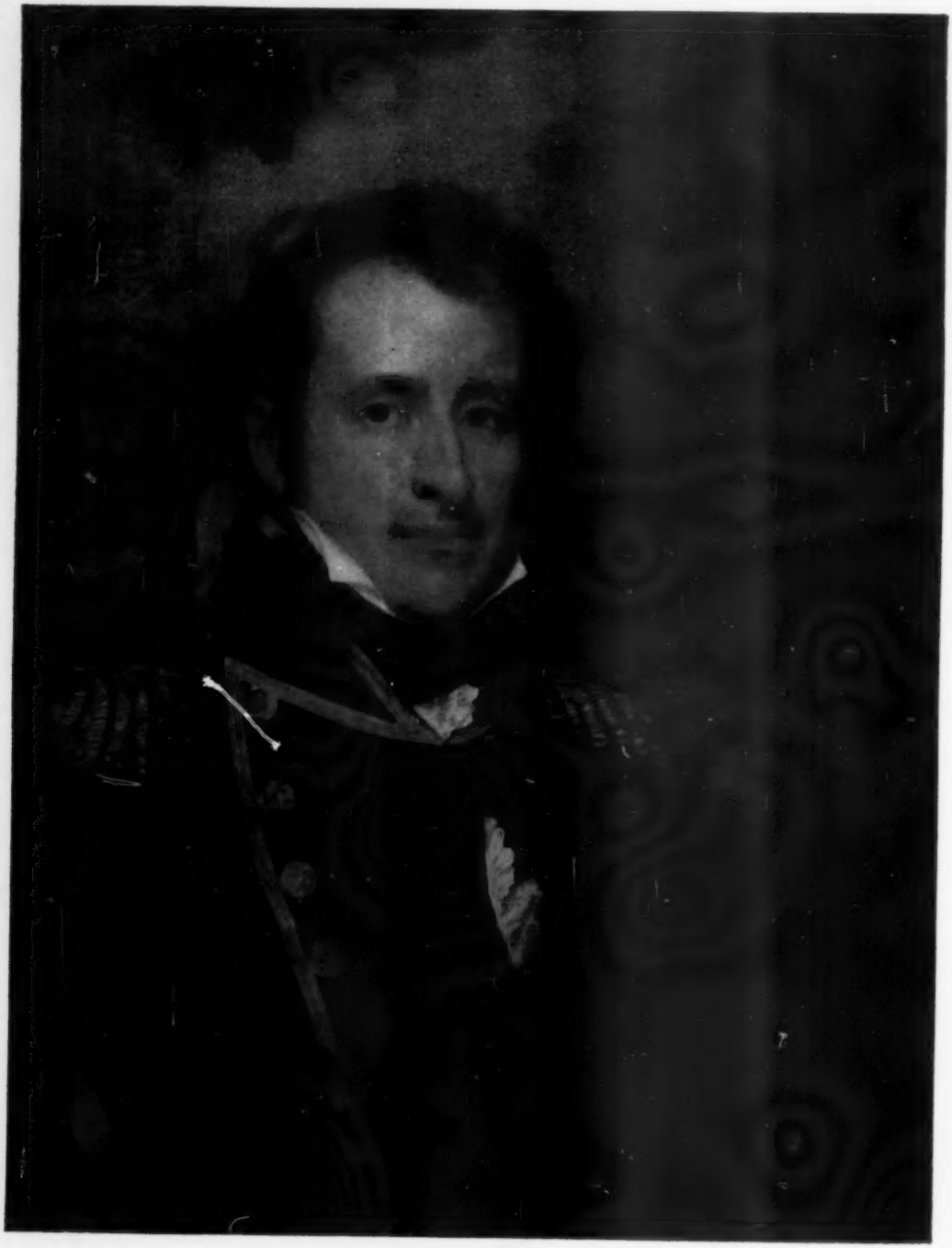
Courtesy Naval War College. From Macpherson Collection

LORD RODNEY DEFEATING THE COMTE DE GRASSE IN THE WEST INDIES, APRIL 12, 1782
(Engraving by P. Mazell after T. Luny, published October, 1782).

Courtesy Captain R. D. White, U. S. Navy

THE TRANSFER OF ADMIRAL DE GRASSE'S HEART FROM THE CHATEAU TO THE CHAPEL AT TILLY, APRIL 25, 1928

THE TRANSFER OF ADMIRAL DE GRASSE'S HEART FROM THE CHATEAU TO THE CHAPEL AT TILLY, APRIL 25, 1928



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1779-1820

(From the portrait attributed to Jarvis)

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Vol. No. 55, No. 1 JANUARY, 1929 *Whole No. 311*

A Great Forgotten Man

By COMMANDER A. H. MILES, *U. S. Navy*

IT IS a tradition that when General Pershing arrived in France in 1917 at the head of the American Expeditionary Forces he knelt at the tomb of the Revolutionary hero, General LaFayette, and appropriately said, *"LaFayette nous voilà."* These words represented in terse language the thought of many Americans, that our Army in France was to repay the debt we owed on account of the services of the French General LaFayette.

Less epigrammatically, but obviously expressing a like sentiment, Admiral Gleaves on landing in France expressed himself in these terms:

> A few weeks ago I was at the foot of the monument at Yorktown, Virginia, which commemorates the gaining of our independence with the assistance of the great French Admiral de Grasse. Today, when our Navy is receiving the hospitality of the French port, where our Army has landed, is the happiest day of my life.

As Pershing returned the visit of LaFayette, so Gleaves, coming straight from Virginia to France, greeted, before the whole world, De Grasse, the French admiral of 1781.

It is coming to be appreciated in this country that the deeds of Admiral de Grasse in behalf of American independence take rank next only after those of Washington himself, for the story tells of the determining influence of De Grasse's fleet on the outcome of the Yorktown campaign and the attainment of our national life. As Washington wrote to the admiral:

> The surrender of Yorktown which has won so much glory and profit for the Allies, and the honor of which is due to your Excellency, is far beyond our most sanguine expectations.

While De Grasse's name has been scarcely a memory in America and unknown even to most Frenchmen, from the career of this man it is unmistakable that he was no ordinary type of naval officer but one of wide experience in actual battle, and as well an accomplished strategist and tactician. Not the least of his virtues was the ability to make quick decisions and willingness to accept immense responsibilities, even to the extent of disregarding the orders of the French ministry when he considered it necessary for the common cause. The life of De Grasse, whose traits of character have not hitherto been revealed to us, will make it clear why history should place him in the front rank of distinguished naval officers. Is it not time for us to give to that eminent sailor the place to which he is entitled?

François-Joseph-Paul de Grasse was born on September 13, 1722, at the feudal castle of Bar, a picturesque village of Provençe, situated six miles from the town of De Grasse. The family from which he sprang was one of the oldest of the French nobility, claiming descent from Rodoard, prince of Antibes in 993, and boasting of its alliance by intermarriage with the royal houses of France, Spain, and Sicily. The Captal de Buch, so famous in Froissart, was one of the ancestors of the Count de Grasse. His family bore the name of De Grasse from the eleventh century, and that of Rouville from 1676. His father, François de Grasse-

Rouville, Marquis de Grasse, was a captain in the army.

The family castle was of stately proportions and flanked by two lofty towers. We know that the castle in as early times as the Crusades was in the hands of the high and powerful lords De Grasse, and it was owned by them until 1832. During the French Revolution it had been partially destroyed and in the latter half of the last century its towers were overthrown by seismic disturbances. At the present day it is seen by tourists as only a majestic ruin.

It seemed as if nothing was wanting to complete the distinction and eminence of the De Grasse family; saintliness was not even denied them. One of their female ancestors was canonized under the name of Sainte Maxime de Grasse, whose feast day on May 16 is especially revered in the diocese of Frejus, particularly in the little village of Callian, where her relics are kept and venerated. Each of Admiral de Grasse's five daughters bore the name of Sainte Maxime.

On the day following his birth the child was baptized in the church of Bar as Chevalier de Grasse de Bar. Later were added the titles of his illustrious ancestors as well as those he himself earned in the service of his country. We shall see him: Comte de Grasse, sovereign prince of Antibes, marquis de Tilly, seigneur de Flins, Mondreville, Saint-Tourent, Valette et Vernes, commander of the order of Saint Louis, knight of St. John of Jerusalem, and of Cincinnatus, lieutenant general of the naval forces.

Being of robust constitution and great strength, in early childhood he developed a liking for energetic sports. Family tradition has it that his private tutor was unable to repress his impetuosity or outbursts of temper. Foremost among youths as unruly as himself, his rambling propensities led him daily into the gorges and on the craggy slopes about the Castle de Bar.

Such a spirit as this must be curbed, so his parents decided when at the age of eleven years that he should be sent to the school of the Gardes Maritimes at Toulon. Here the boy's general behavior was satisfactory and his promising character resulted in his being received with a payment of 300 crowns as an aspirant to the Order of the Knights of Malta. The Knights of Malta had their origin in 1048 A.D. with the Hospitallers of St. John of Jerusalem, and acquired great wealth and power during the Crusades. When the Holy Lands reverted to the Moslems, the order withdrew its seat successively to Acre, Cyprus, and Rhodes and finally they obtained from Charles V the privilege of settling on the island of Malta. There they equipped ships for the defense of the Mediterranean Sea against the Mussulman pirates; in fact at the time young De Grasse joined, they were alone in combating these corsairs with any success.

Thus the young knight, twelve years old, enrolled on board the frigate *Eole*, "religious" ship as it was called, beginning a long and illustrious career as a sea fighter. In doing so he sacrificed an opportunity to go to the court of Louis XV as a page. We can but conjecture what would have been the future of one of his noble lineage, brilliant intellect, and commanding figure. But in his heart was love of the sea and adventure and in this vigorous school of fatigues and perils the young sailor quickly developed a sturdy physique and a calm and self reliance which stood him in good stead in many a tempest and sea fight. His energy and impetuosity led him into the thick of every fray and even in later years he retained these most typical characteristics. Of his exceptional bravery, friend and foe alike testify.

Canon Max. Caron tells the following story which sheds some light on a trait in De Grasse's character:

> When but an ensign of fifteen or sixteen years of age, he gives a soldier an order which the latter refuses to obey. Instantly the youth, already a giant in stature and strength, seizes the culprit and throws him as a projectile through space from the starboard to larboard. But fearing to have hurt him he rushes to pick him up. Fortunately there were only slight bruises and reconciliation was effected by mutual excuses.

As page to the Great Master of Malta, as midshipman and as ensign, the young officer went through numerous strenuous campaigns in the Mediterranean against the Moorish pirates. At the age of twenty (1742) he entered the French Navy and served on board numerous vessels. In 1747 he was on board the frigate *Emeraude* in La Jonquiere's squadron of six ships and six frigates under orders to escort to

Pondicherry a convoy of twenty-five ships belonging to the East Indian Company. This squadron was met off Cape Finisterre on May 11, 1747, by seventeen English vessels under Admiral Anson, and after a vigorous engagement six French vessels, including the *Emeraude*, were captured and De Grasse was taken to England a prisoner, where he remained two years. While a prisoner De Grasse acquired many English friends and gained knowledge of the enemy that stood him in good stead in after years.

Upon his return to France, De Grasse became lieutenant de vaisseau (corresponding to our lieutenant, senior grade) and participated in divers campaigns in the Mediterranean and the West Indies until 1758, when he received command of the sloop *Zephyr*. He remained in this vessel three years and accomplished various important missions, one an exploring expedition to the coast of Guinea (Juina).

In January, 1762, he was promoted to capitaine de vaisseau (corresponding to our captain) and was assigned to command of the *Protèe*, on board of which he took part in another campaign in Santo Domingo and the West Indies. In 1764, he received the title of chevalier de St. Louis and assumed command of the frigate *Heroine* in the squadron of Comte du Chaffault, under whose orders he took a gallant part in the bombardment of Sale (1765). Various services called him to all parts of the world, and at the age of fifty we find him ripe in experience, taking part in the maneuvers of the squadron of D'Orvilliers. France and the budding new republic in America were soon to have need of him.

In February, 1778, Louis XVI signed a treaty of alliance with the United Colonies of America. On July 27 of that year we see Count de Grasse in command of the *Robuste* taking part in the famous battle of the Ouessant (Ushant) between Keppel and D'Orvilliers. The battle was indecisive due to failure of the French van squadron commander to obey the commander-in-chief's orders. No ships were sunk and both fleets returned intact to home ports. The action nevertheless occasioned notoriety in England, where a storm of indignation arose over the lack of results. De Grasse was one of the French captains who showed marked ability as a seaman and fighter and was afterwards promoted to command of a squadron of five ships of the line with attendant light craft. In this capacity he was ordered to the West Indies to join Count d'Estaing.

He served in the triumphs and reverses of D'Estaing's campaign, in the reduction of Granada, and the siege of Savannah, after which he joined De Guichen, the new commander-in-chief, who was a worthy rival of Admiral Rodney in the Antilles. The fleets fought an indecisive engagement off Martinique. De Grasse in the *Robuste* at the head of the line distinguished himself by closely engaging the English Admiral Parker, and rescuing the *Sphynx* and *Artesien* from superior English forces. Twice more in the following weeks the two fleets clashed with no results, and the supremacy of those waters remained undecided.

De Guichen, advanced in years and in ruined health, was recalled to France, taking with him De Grasse and his squadron. Although in a secondary rôle, De Grasse had fought with skill and distinction and his fame had already preceded him to France. He was received at Versailles with conspicuous consideration. The king welcomed him with cordiality and the queen showed him the unusual honor of offering her arm when crossing the galleries of the castle.

The plan of sending a strong fleet to America was in the making. All eyes turned towards De Grasse, as the personification of bravery and professional skill, to lead this new expedition upon which rested the fate of the struggling American colonies.

On March 22, 1781, there were assembled in the spacious harbor of Brest the ships of the expedition. Never before had the port accommodated so many craft and the spectacle brought thousands of visitors who lined the cliffs and cheeringly bade Godspeed to De Grasse and the sailors of France. M. de Casties, minister of the navy, and his suite, from the elevated Fort Ric, proudly viewed this forest of masts and signaled leave to get underway. Sails were loosed, prows stood seaward, and it was not until late into the night that the roadstead was empty. The immense convoy of 150 merchant vessels escorted by twenty-one ships of the line, three frigates and thirteen sloops of war, were now on their way to Martinique in the Caribbean Sea. After an unheard of quick passage of thirty-six days,

THE FRENCH LINE OF BATTLE

At the Naval Action Off the Chesapeake Capes, September 5, 1781

Ships	*Guns*	*Men*	
			VAN
Le Pluton	74	800	M. D'Albert de Rions
La Bourgogne	74	800	De Charitte
Le Marseillais	74	800	De Castellane de Majastre
Le Diadème	74	800	De Monteclerc
Le Réfléchi	64	550	Cillart de Suville
L' Auguste	80	987	De Bougainville, chef d'escadre Castellane
Le St. Esprit	84	987	De Chabert
Le Caton	64	550	De Frammond
			CENTER
Le César	74	800	Coriolis d'Espinouse
Le Destin	74	800	Dumaitz de Goimpy
*La Ville de Paris**	110	1200	De Grasse, Lieut.-Gén. De Sainte-Césaire De Vaugirault, major d'escadre
Le Victoire	74	800	D'Albert Saint-Hippolyte
Le Sceptre	74	800	De Vaudreuil
Le Northumberland†	74	800	De Briqueville
Le Palmier	74	800	Baron D'Arros d'Argelos
Le Solitaire	64	550	De Cicé Champion
			REAR
Le Citoyen	74	800	Comte d'Éthy
Le Scipion	74	800	De Clavel
Le Magnanime	80	887	Le Bègue
L' Hercule	74	800	Turpin de Breuil
Le Languedoc	96	1000	De Monteil, chef d'escadre Duplessis Parscau
Le Zélé	74	800	De Gras-Préville
L' Hector	64	550	Renaud d'Aleins
Le Souverain	74	800	De Glandevès

* Masthead height, 192 ft.; length, 185 ft. 7½ in.; beam, 53 ft. 8½ in.; draft, 22 ft. 2 in.; displacement, 2,347 tons.

†Masthead height, 170 ft.; length, 178 ft. 0 in.; beam, 48 ft. 2½ in.; draft, 21 ft. 2 in.; displacement, 1,801 tons.

the fleet with convoy intact sighted land. Here De Grasse had a skirmish with Admiral Samuel Hood with eighteen ships but brought his entire command safely to port.

The islands of St. Vincent and Granada were revictualled; an armed expedition sent against Gros Islet; St. Lucia and Tobago were captured and on July 16 De Grasse arrived at Cape François (now Cape Haitien) with a convoy of 150 sail. Five more ships of the line joined under De Monteil, who had just returned from the capture of Pensacola, Florida. Help for the hard-pressed colonies was near at hand and De Grasse put his energetic mind to the task without delay.

The complete story of De Grasse's borrowing troops and money, of his ruse in deceiving Rodney, of his passage to the Chesapeake capes, of his prompt landing of troops, munitions and food, of his masterful tactics in defeating and out-maneuvering the British fleet under Admiral Graves was told in the November, 1927, issue of the NAVAL INSTITUTE PROCEEDINGS under the title, "Sea Power and the Yorktown Campaign."* These brilliant events brought the surrender of Lord Cornwallis, the suspension of hostilities on the continent, and made American independence an assured fact.

In this campaign the part taken by De Grasse was without flaw, the mission was always kept in the forefront and his sound strategical and tactical decisions were exe-

* For reference purposes the battle lines of the fleets engaged on September 5, 1781, are here given.

THE BRITISH LINE OF BATTLE

At the Naval Action Off the Chesapeake Capes, September 5, 1781

Frigates	*Ships*	*Guns*	*Men*	*Commanders*	*Division*
			VAN		
	Alfred	74	600	Captain W. Bayne	Sir Samuel Hood, Bart. rear admiral of the blue.
	Belliqueux	64	500	Captain Ja. Brine	
	Invincible	74	600	Captain Cha. Saxton	
Santa Monica (to repeat signals)	*Barfleur*	98	768	Sir Samuel Hood, Rear Admiral Captain Alex. Hood	
	Monarch	74	600	Captain Frs. Reynolds	
Richmond	*Centaur*	74	650	Captain J. N. Inglefield	
			CENTER		
	America	74	500	Captain Samuel Thompson	Thomas Graves, Esq.; rear admiral of the red, commander-in-chief.
Solebay	*Resolution*	74	600	Captain Lord Robert Manners	
	Bedford†	74	600	Captain Thomas Graves	
La Nymphe (to repeat signals)	*London**	98	800	Rear Admiral Thomas Graves Captain David Graves	
	Royal Oak	74	600	Captain J. P. Ardesoise	
	Montagu	74	600	Captain Geo. Bowen	
Adamant	*Europe*	64	500	Captain Smith Child	
			REAR		
Salamander (fire ship)	*Terrible*	74	600	Captain Hon. Wm. Clem. Finch	Fran. S. Drake, Esq.; rear admiral of the blue.
	Ajax	74	550	Captain N. Charrington	
Sybil (to repeat signals)	*Princessa*	70	577	Rear Admiral F. S. Drake Captain C. Knatchbull	
	Alcide	74	600	Captain Charles Thompson	
La Fortunée	*Intrepid*	64	500	Captain A. J. Pye Molloy	
	Shrewsbury	74	600	Captain Mark Robinson	

* Masthead height, 186 ft.; length, 177 ft. 6¾ in.; beam, 50 ft. 5 in.; draft, 21 ft.; displacement, 1,645 tons.

† Masthead height, 170 ft.; length, 168 ft. 6 in.; beam, 40 ft. 9 in.; draft, 20 ft.; displacement, 1,606 tons.

cuted as planned. Washington was lucky indeed to have the aid of this determined and experienced admiral.

A close study of the campaign reveals De Grasse to have been a man of unusual initiative and judgment. His refusal to weaken the fleet by as much as a single ship for convoy duty was unprecedented in that day—a mistake Rodney made which caused the English fleet to be numerically inferior in the battle which was to follow. The borrowing of troops from Haiti without authority from the ministers at home was shouldering a great responsibility and the embarking of these troops on his ships of war rather than on transports, showed unerring realization of the time factor involved. The quick disembarkation, the ready cooperation with Washington, the landing of stores and marines from his ships, and even the donation to the army of his fresh cattle, shows De Grasse to have been a man of generosity as well as of action. Of his getting underway, with ninety officers and 1,900 of his best men ashore assisting in the disembarkation, upon sighting Graves's fleet, it can be said that this was a difficult decision to make but undoubtedly the only correct one. Graves was out-fought, decoyed away from the capes, and out-maneuvered, by which tactics De Grasse made it possible for De Barras' squadron carrying the siege artillery to reach the York River. By this move his force had now become overwhelmingly preponderant and all hope of succor for Cornwallis had vanished. For this turn of affairs De Grasse deserves unstinted praise and the glory will forever be solely his.

Washington was anxious that the admiral

now assist in an attack on Charleston, South Carolina, but De Grasse was under obligations to the governor of Santo Domingo to return the borrowed troops, and events in the West Indies required his attention.

Fortune had smiled upon De Grasse until now but with the return of the king's fleet to southern waters began the succession of dramatic and tragic events with which this sailor of forty-eight years' service was about to close out his career.

At the famous Battle of the Saints near Dominica, De Grasse himself in his flagship the *Ville de Paris,* was captured by Lord Rodney. While escorting a large convoy of 150 vessels with his fleet, Rodney came up with him and forced the undecisive, but probably the most talked of sea fight of contemporaneous history. Students of naval history are apt to find that the decisions of De Grasse in this encounter were sound, but that his actions were attended by an unparalleled chain of misfortunes over which he could exercise no control.

A single ship, the *Zélé,* was so atrociously handled during the maneuvers preceding the action that she first collided with and seriously crippled the *Jason,* and the next night, in violating the rules of the road and De Grasse's express orders, she actually rammed the flagship, doing considerable damage and disabling herself to such an extent as to require towing. In his efforts to protect the *Zélé,* De Grasse was brought to battle in the baffling winds under the lee of Dominica while giving up an advantageous position far to windward. All would have been well however, had it not been for the almost unbelievable neglect of his ship captains in failing to execute a signal to the fleet to wear simultaneously and bring the battle line abreast the enemy on the same tack. At this juncture a trick of fate interposed in a shift of wind which took his ships aback and favored the English, who quickly seized the opportunity and broke through the French line placing several French ships under heavy fire. Attempting to reform the line to leeward, again his captains failed to obey signals and De Grasse was left to his fate surrounded by nine enemy ships without support. He kept up the unequal battle against heavy odds until sails were torn, rigging shot through, mast and yards splintered, most of his officers and men killed and ammunition expended. Four other ships besides his own were taken but the main body escaped to leeward without being followed.

The *Ville de Paris* was a three-decker, carrying 1,200 men, the largest ship of her time, which had been presented to the French Navy as a gift from the city of Paris. Rodney was so exalted over her capture with De Grasse aboard, that he refused to leave her and take up the chase. For this he was severely criticized by Admiral Hood, his second in command.

De Grasse felt the dereliction of his captains so keenly that on the day following the battle he wrote a report in which he threw upon them the blame for the misfortunes of the day. Some had disobeyed his signals, others had abandoned him. Later, while still a prisoner, he published several pamphlets which were made public. Had not his impetuosity caused him to make these charges public before returning to France, he would have been in a much more favorable position in the court-martial which was to follow.

This was the first time a French commander-in-chief had ever been captured in his flagship and in England the extent of the victory was therefore magnified out of all proportion. De Grasse was taken to Jamaica, then to England, where in London he was received more as a guest of honor than as a prisoner. He was treated with that magnanimous and flattering attention which comes easily from the victor to the vanquished and for which his personal valor and fame was not unworthy. In the aristocratic world, people vied with each other to show him consideration and to receive "the intrepid Frenchman" at their tables. Artists begged to be allowed to paint his portrait (several of these exist today). His title of "Prince of Antibes," his lordly manners, his fine figure, the distinction of his features, conquered the ladies. He was called to the balcony of his rooms several times by the clamoring populace. There is evidence that he considered these things lacking in good taste for a prisoner, but he was overwhelmed—his high-strung nature rebelled, but he felt that by accepting a certain amount of attention he would be in a position to render service to his king and country.

Sir Gilbert Blane, fleet surgeon with Rodney, wrote of De Grasse:

He bears his misfortune with equanimity; conscious, as he says, that he has done his duty. . . . . He attributes his misfortune, not to inferiority of force, but to the base desertion of his officers in the other ships to whom he made the signal to rally, and even hailed them to abide by him, but was abandoned.

It was natural that when rumors of these adulations reached France it would cause jealousy—De Grasse's motives being popularly misunderstood. Drawing-room tacticians criticized his maneuvers and he was generally disparaged. In society then it was the fashion to wear a small gold cross with a heart hanging to it and those bitter against the admiral took off the heart, saying *"Des grâces san coeur,"* by this play of words insinuating that De Grasse had no heart for his country.

While the admiral was being so cruelly ridiculed at home, he was commissioned to arrange for the exchange of prisoners and to assist in the drawing up of the peace terms which were to be favorable to France and give independence to America. It is an anomaly of fortune that the defeat of De Grasse, while a stunning blow to French pride, reacted in favor of the colonies by the psychological effect of putting England in a good humor and making her more receptive at the peace negotiations. It was some time before Great Britain awoke to the fact that hers was a hollow victory and that De Grasse was great even in defeat.

At this time Washington wrote to the admiral:

The cordiality and frankness that animated us, my dear Admiral, at the time of our operations in Virginia will never be effaced from my memory.

It will be remembered with pleasure by me throughout my life. I should much like to renew to Your Excellency the expression of my affection, and to go to Europe to greet you. I do not yet know when that will happen; but I shall consider the moment when I have the pleasure of meeting you again, be it in Europe or in America, as one of the happiest of my life.

Allow me to present you my truest and sincerest congratulations on the happy issue of the war. It is as favourable to America as it does honour to the disinterested generosity of your country.

Your timely intervention has given to America independence and liberty.

I would I were able to express to you and to the officers of the French Army and Navy the gratitude of the United States.

The unhappy incident undergone by Your Excellency on April 12, has detracted nothing from your glory in this country, where your great character is appreciated, and where the circumstances of the contest are known.

Be assured that your reverse has not lessened the esteem I have for your bravery and your ability to lead the great army which the King had entrusted you. It only proves that the greatest heroes are ever exposed to the blows of fortune who is a capricious mistress.

With the signing of the peace treaty, the prisoner left London for Versailles where he was cordially welcomed by the king and queen.

The government then conducted an exhaustive inquiry into the events in connection with the Battle of the Saints, and all papers, logs, witnesses, etc., were gathered at Lorient in January, 1784, when the admiral and several of his captains were court-martialed. Of this De Grasse wrote:

The justice of the King did not permit my conduct in the battle of April 12, 1782, to remain subject to public condemnation without being judiciously examined. This is the most I can expect from His Majesty in my misfortune after forty-eight years of service, thirty campaigns, twelve battles in this war, after having captured several islands with the entire enemy garrisons and having assured the Independence of the United States of America.

The findings of the courts awarded slight punishments to some of the captains who failed in their duty and acquitted the admiral, while criticizing him rather captiously for certain failures during the preliminary maneuvers which De Grasse had laid at the doors of the captains who had not obeyed his signals. He said:

One should not be astonished that the most important maneuvers were not executed, nine of my signals were absolutely disregarded. . . . . They cannot prove that the signals were impossible of execution, without showing that at least they began to obey them, and actually encountered an invincible obstacle, or at least to have made known their inability by signal. An excuse of this sort is always easy, and the consequences of it would set a dangerous precedent . . . . the glance of the commander-in-chief suffices to prove the possibility of the movement which he orders. There should be no deliberation, otherwise the crucial moment passes and the commander-in-chief must answer to his King and Nation.

De Grasse's contention is certainly well founded.

There is evidence that De Grasse, by the sweeping denunciations of so many of his subordinates, brought down upon his own

head much testimony unfavorable to his case. In his early attempts at exculpation, in placing the blame upon others, particularly in pamphlets issued in London while yet a prisoner, he naturally created a bad impression and brought upon himself a particularly active and uncompromising opposition.

De Grasse was dissatisfied with the findings of the court and asked for a new trial which was refused. The minister replied that the king, while he believed everything was done to prevent the misfortunes of the day, was dissatisfied with the admiral's conduct in so far as the bringing of charges against his officers were concerned, and forbade him an audience. Under the circumstances there was nothing more for De Grasse to do but to retire to his home to meditate upon the fickleness of fate.

Dante once said: "There is no greater sorrow than to remember happy times in the hour of misfortune." Doubtless more than once in the depths of solitude at his home at Tilly did this old sailor call to mind the glorious day when he, the commander-in-chief upon the quarter-deck of his stately flagship, sailed from Brest harbor with his great armada to give America freedom, and doubtless he cogitated sadly on the ingratitude of man.

On the other hand a great joy awaited Admiral de Grasse at his small castle at Tilly; he was to be reunited with his family after nearly half a century at sea, and to enjoy the pleasures of home life. When forty-two years old he had married, at Versailles, Demoiselle Antoinette-Rosalie Accaron, who died when only twenty-nine, after having given birth to seven children, one son and six daughters. Between voyages, the admiral had married Dame Catherine de Pien, widow of Count de Villeneuve, but she also was to die soon. At the time of his retirement his only son was eighteen years old and his youngest daughter ten. Two years later he took his third wife, the unworthy Christine-Lazare de Cibon, who is said to have brought him only unhappiness.

The admiral also owned a hotel in the Saint-Roch quarter of Paris which he kept as a *pied-à-terre* where he could occasionally mingle with the society he liked, for his titles and his fame, coupled with a natural charm of manner, assured for him a high place in Parisian life.

But his favorite place of residence was the Castle of Tilly. Tilly is a little village of 300 people, situated on high land, twelve miles beyond Mantes towards Dreux. The castle, feudal in appearance, dates from Henry IV. On the side of the court of honor the square structure is flanked by two turrets; it is surrounded by a moat now partly filled up and it had three drawbridges leading from the front of the façade, the garden and the park. As at Versailles, the park is surrounded by trees and shrubs and enclosed by a wall a mile and a half long. In the park he had walks made, trees planted, and lawns laid out. The shady avenue of trimmed lime trees called "Admiral's Alley" is admired by visitors today.

He was not only the owner of the castle but the lord of Tilly, of Saint Laurent, of Flins, of Mondreville and other places, and he gave encouragement to the tilling of the fields and helping the farmers.

An object of the admiral's special solicitude was the village church. This church had no steeple and he had one added at his personal expense and equipped it with a bell. Here he often went to prayer with his children.

Honors came from America in the shape of a gold medal of the order of the Society of Cincinnati. The Congress of the United States voted four cannon sent him and great was the excitement in the little village the day they arrived, upon each engraved the following inscription:

> Taken from the English Army by the combined forces of France and America, at Yorktown, in Virginia, on the 19th of October, 1781, and presented by Congress to His Excellency the Count de Grasse, as a testimony of the priceless services rendered by him on that memorable day.

These guns were set up on carriages and placed in the courtyard. One can still see the iron grating pierced with loopholes for the muzzles. Unfortunately the guns themselves are gone—sacrificed to the vandalism of the French Revolution.

In the midst of this peaceful existence, at the age of sixty-six, the soul of this great man was destined to pass. It may have been providential, for a few years later France was lashed by the fierce violence of the Revolution and it is not unlikely that he would have fallen victim to the guillotine for having served the monarchy so well. It will be well remembered that Rocham-

beau was thrown into prison and only escaped death by the fall of Robespierre.

De Grasse died in his Paris hotel on January 14, 1788, and by his express wish the body was buried in the church of Saint-Roch and the heart removed therefrom and taken to rest in his little church of Our Lady at Tilly. In a simple shallow grave near the altar the embalmed heart was deposited inclosed in a lead shell. This last wish bespeaks eloquently the tender and sentimental nature of the man.

Washington, in a letter to the Count de Rochambeau, who announced the death of their fellow commander at Yorktown, says:

> I am sorry to learn that the Count de Grasse, our gallant coadjutor in the capture of Cornwallis, is no more. Yet his death is not perhaps so much to be deplored as his latter days were to be pitied. It seemed as if an unfortunate and unrelenting destiny pursued him to destroy the enjoyment of all earthly comfort. The disastrous battle of the 12th of April, the loss of the favor of his king, and the subsequent connection in marriage with an unworthy woman, were sufficient to have made him weary of the burden of life. Your goodness in endeavoring to sweeten its passage was truly commendable, however it might have been marred by his own impetuosity. But his frailties should now be buried in the grave with him, while his name will be long deservedly dear to this country, on account of his successful coöperation in the former campaign of 1781.

Surviving the admiral were his third wife and his five children. Two had already died. Those living were: Alexandre-François-Auguste, Marquis de Grasse, and Mesdemoiselles Amelie-Maxime-Rosalie, Justine-Adelaide-Maxime, Mélanie-Veronique-Maxime and Silvie-Alexandrine-Maxime.

The political horizon of France darkened. The wind of the Revolution was raised by the impiety of Voltaire and the theories of Rousseau and for a short two years more the castle sheltered the orphans. Then the deluge! The castle was plundered, confiscated, and sold. America's gift of guns was stolen and melted into coin. The church was looted. The heart only escaped desecration by the failure of the revolutionists to find its resting place.

Offered asylum in America, the descendants escaped prison and the guillotine by fleeing across the ocean where they were tendered every care under the guidance of George Washington, who of all men was best able to appreciate the sterling qualities of their father. The daughters remained in the United States, married and founded prosperous and respected families, whose descendants survive in the names of Fox, Livingston, Coster, Pau, Fowler, Redmond, Drayton, Kirkpatrick, Barklie, Schuyler, and others. The son later returned to France and had five daughters who died childless; there are, however, many collateral descendants of the illustrious name De Grasse in France today.

It is not difficult to see how De Grasse's memory was effaced in the turmoil of the Revolution and thereafter, until at the end of the last century his name and fame were all but forgotten. America was too busy to remember or to appreciate.

After many vicissitudes the castle of Tilly, in 1870, passed into the hands of M. Bertrand Lecrivan, who donated it to the Association des Ancien Elèves du Petit Séminaire de Versailles as a center and orphans' home. A few years later the dilapidated condition of the church necessitated its restoration and in the course of the digging a search was made for the admiral's heart. It was found in the spot where it had lain undisturbed for more than a century beneath a small marble slab fixed to the wall, upon which was outlined:

> Here lies:
>
> At the foot of the high altar, by the side of Christine-Marie-Delphine de Cibon, his widow, the heart of François-Joseph-Paul Comte de Grasse de Rouville, Count and sovereign Prince of Antibes, Marquis of Tilly, Lieutenant-General of the naval forces, Commander of the Royal and Military Order of Saint-Louis, Knight of the Order of Cincinnatus and of Saint-John of Jerusalem, non professed.
>
> Born on the 13th of September, 1722.
> Died on the 14th of January, 1788.

A leaden heart-shaped reliquary engraved with *fleur-de-lis* served as its receptacle. When opened it gave forth an agreeable fragrance of spices with which it had been embalmed. The relic was reinterred with due ceremony in an oak coffin and placed in a vault covered by a large tombstone upon which was engraved the arms of the house of De Grasse, and a suitable motto.

It would not be correct to say that America has completely forgotten De Grasse, for Congress erected at Yorktown, Virginia, in 1881, a noble granite shaft upon which, conjointly with Washington and Rochambeau, his name is placed.

Throughout our land, LaFayette, who peculiarly typifies the moral sympathy of France, has been perpetuated by no less than seven monuments, his name has been given to a college, highways, streets, buildings, theaters, and what not, while De Grasse, whose name more than any other's represents the material succor which France gave to the struggling life of the young republic, has been singularly neglected.

The writer ventures the suggestion that this country give some official national recognition of a personal nature to Admiral de Grasse in the form of a statue situated in a prominent place in Washington, District of Columbia, and that it would be particularly fitting if the U. S. Navy would commemorate his naval achievement in the Yorktown campaign by naming, in his honor, one of its new large ships the *De Grasse*.

America, search your conscience! Admiral de Grasse did much for you—what have you done for him?

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Seagoing Customs

By CONSTANCE LATHROP

SPLICING THE MAIN BRACE

ON NOVEMBER 11, 1918, there was flashed to the Allied fleet assembled at Rosyth, the following naval signal: "The armistice commenced at 11:00 today, Monday, and the customary method in H.M. service of celebrating an occasion is to be carried out by ships companies splicing the main brace at 19:00 today. Hands are to make and mend cloths."

Splicing the main brace has been a naval custom since Nelson's time—that day of hemp and sail wherein originated so many of the customs and traditions of sea life with which the naval services of today abound. It has celebrated all great victories of the British Navy, and was a time honored custom in the American Navy before "grog" became forbidden fruit.[1]

GROG

Admiral Vernon of the Royal Navy is responsible for the term "grog." The admiral usually wore in bad weather a grogram cloak—because of this sailors dubbed him "Old Grog." When he issued his famous order in 1740 that the spirit ration be diluted with water, the mixture was termed "grog."

CROSSING THE LINE

The ways of seamen are at times passing strange—the origins of these ways frequently date back to earliest recorded history. No custom of ship life is more ancient, or more generally known, than that of the ceremony of crossing the line. The details of this ceremony vary, but it is always a tribute to Neptune exacted of officers and men by Neptune's sons.

Naval historians tell us that this custom had its origin in propitiatory offerings to the deities of the sea by mariners who sailed the seven seas when little was known about the art of navigation, and when it was thought that gods and goddesses controlled the elements, as well as the fate of seamen. In more enlightened times the religious idea of the ceremony was superseded by the present order of things, which is merely a pastime for the sailors. Neptune and Amphitrite appear on board the vessel as it approaches the line and after announcing their arrival to the captain, hold court among Neptune's subjects, who in turn initiate all those who have never before crossed the line. The initiation is usually a rough experience—idiosyncrasies of the neophyte are dwelt upon. After being lathered with some frightful concoction and shaved, all novices receive a ducking.

SALUTES

One of the oldest customs of the civilized world is expressed in the form of salute by touching the cap. It dates back to the period of knights and jousts. When knight met knight upon the highway, or in tournament, he raised the visor of his helmet to identify himself as an honorable knight. From this gesture of chivalry originated the military salute of today.

The sword salute originated in the time of the crusades when the hilt of the crusader's sword was made in the form of the cross. Every crusader kissed the cross as a seal of his purpose and faith and swore by the hilt of the sword, raising it to his lips for that purpose.

Another custom passed down through the ages from the crusades, and one that has been a custom in all Christian navies since then, is that of placing an officer's cap and sword on his coffin during burial services. The crusader's shield and arms covered him in death.

[1]EDITOR'S NOTE: It is noted that the address of this signal included "Negative 6.B.S." The Sixth Battle Squadron was made up of American ships operating with the Grand Fleet. Of course "Splicing the main brace" means serving out a ration of rum to all hands. Unfortunately the Americans do not seem to have been included.

From a religious origin sprang the custom of saluting the quarter-deck. This is said to have first come into practice during the Roman Catholic predominance, when a shrine of the Virgin had its place on the quarter-deck of all fighting craft and the seamen were wont to uncover in passing. The practice grew into and has been perpetuated as a part of ship discipline on all naval vessels and on some merchant vessels.

The salute with guns dates from the earliest appearance of ordnance. Until the reign of James I, when shotted salutes were prohibited, the shot of honor was as deadly as that of hostility except that it was not aimed at the saluted vessel. Guns were fired in this manner on every possible pretext and frequently wrought much damage. The first regulations concerning the gun salute in the British Navy were drawn up in 1702.

Dutch Courage

A phrase much in use today—"Dutch courage"—comes down to us from the time of Tromp and De Ruyter. The crews of the Dutch fighting craft were given a nip of Holland before going into action. This was derisively termed by their English foes as "Dutch courage."

Boatswain's Whistle

According to tradition, the whistle carried by the boatswain commemorates the defeat of the Scotch pirate, Andrew Barton, in 1511. Barton had become so powerful and his plunderings so numerous that an expedition was sent against him. His two vessels, the *Lion* and the *Jenny Perwin*, were taken after a lengthy and determined fight by Lord Edward Howard. The latter secured a whistle from the body of Barton and later when he became lord high admiral he had it adopted as a boatswain's whistle.

Manning the Rail

A manuscript written by Dr. Roger Marbecke in 1596 at the time of the Cadiz Expedition tells the origin of "manning ship" and "three cheers" as official acts:

> These hailings then are in this order. When after a day's absence or more, as occasion serveth, they come near to the Lord Admiral, and yet not too near, but of such seasonable distance as they may not endanger themselves of going foul of one another, they presently man the ship and place every one of their companies both upon the upper and middle deck and also upon the waist and shrouds and elsewhere to the most advantage they can to make the bravest show and appear the greatest number. Then the masters and mates of the ships immediately join upon the sounding of their whistles in a pretty loud tunable manner, all the company shaking their hands, hats and caps, give a marvelous shout, with as much mirth and rejoicing as they can, which consisting of so many loud, strong and variable voices maketh such a sounding echo and pleasant report in the air, as delighteth very much, and this ceremony is done three times by them and three times interchangeably answered by the Lord Admiral.

Holystone

The holystone gets its name from the position one manipulating it must assume to use this ever unpopular implement, and not from any use as a *prie-dieu*. It was the custom on early sailing ships when returning from a long cruise to have the ship look as shipshape as possible. Spars were scraped and varnished, the rigging tarred, and the paint work done over. The decks were holystoned. To perform this last labor the seaman knelt on the deck and gave it a scouring with a holystone, sand, and water. The attitude of prayer thus assumed was responsible for the stone being called holy. In latter years the United States Navy improved on this form of work by adopting the squilgee handle to assist in cleaning the decks of its ships. However the name "holystone" is not archaic, nor has this form of labor increased in popularity.

Drawing a Dead Horse

Originating in this same period of maritime history was the custom of drawing a dead horse when about to start on a long cruise. This custom survives today without the picturesque ceremony of those early days. On merchant vessels making trips of many months duration a seaman was allowed to draw five weeks of his pay as soon as he had signed the ship's articles. Most, or all, of this was spent before the ship weighed anchor, and as no further payments could be made until the allotted time had elapsed, the passing of the fifth week was an occasion to be celebrated. The sailors made a horse out of canvas stuffed with tow, which after permission was granted was swung aloft at the yard arm. The horse was then set on fire while the sailors exhibited their glee by manning the shrouds or dancing around the deck.

Piping the Side

Coming down to the present generation from the days when fleets were many months at sea, and their commanding officers had frequently to leave their ships to confer with higher officers, is the custom of "piping the side." When a boat could not go alongside because of a heavy sea or the rolling of the vessel, it was necessary to hoist the captain in over the nettings by a yard and stay. The men, of course, worked with a pipe. Hence when a captain was reported as coming on board the order was, "Very good, hoist him in."

Letting the Cat Out of The Bag

The expression "letting the cat out of the bag" is of nautical origin. When punishment by the use of the cat-o'-nine-tails was abolished the "cat" was placed in a canvas bag and its use became an infraction of the law. Hence the meaning that when the "cat" was taken from the bag, trouble would ensue.

Keelhauling

Keelhauling, today meaning merely a verbal reprimand, was orginally a very cruel form of punishment. It consisted in hauling the offender under the vessel's bottom from one foreyard arm to the other by means of whips, weights being attached to his body to cause him to sink rapidly in the water. This punishment was favored above all others by the Mediterranean pirates of the sixteenth century. Later it was used by the early English and Dutch navies for a certain class of offenses.

Anchor Watch

The duties of the anchor watch of today differ greatly from the day of its origin, which was when cables were made of hemp, and the riding lights in which only oil burned, required especial care. It was then customary after all hands had turned in, for the anchor watch to observe attentively the cables, that the ship did not drag her anchor or the cables part. The anchor watch, as a sea term, is still retained, and each night the order is passed for the anchor watch to lay aft for muster.

Midshipman

The title "midshipman" was originally given to young seamen of the British Navy who acted as messengers, and carried orders from the officers on the quarter-deck to those on the forecastle and thus worked amidships. In the early part of the eighteenth century, these seamen, because of their youth and the fact that they came in direct contact with the older officers, were groomed to become officers. Their quarters were in the cockpit, and various regulations for their entry into the service were issued. They then were chosen because they were relatives of the captain or members of influential families with whom the captain wished to stand in favor. They were termed youngsters in the first years of their service. In the cockpit of this date was first introduced the practice of "sticking a fork in the table"—a practice still employed by senior officers when they desire their juniors to leave their gathering for other parts of the ship. After the first watch was set the older midshipmen stuck a fork in the table, or in the beams above it—as soon as the fork was in its place every youngster at once retired to his hammock. If the signal was disregarded the youngsters were whipped with a knotted cord, or flecked with twisted handkerchiefs till they ran to their hammocks.

Buttons on Cuffs

A British historian tells of the memorable custom, in the British service, which requires buttons to be sewed on the cuffs of subordinate officers:

> In the earlier days of the last century small mites of boys eight or nine years old, and even younger, were sent to sea. When these small boys were first at sea they were one and all so woefully homesick that they had continuous cases of sniffles, and for the first part of their term of service they were forever rubbing their poor little homesick and dripping eyes and noses on the cuffs of their coats. This was so detrimental to the appearance of their uniforms that it led to the sewing on of buttons.

Sick Bay

Nelson, responsible for so many of the British naval customs, and in consequence ours, originated the sick berth in his order to the Mediterranean fleet on May 28, 1798. In line-of-battle ships the sick berth was placed in the bows. When the round bows were introduced in 1811 the sick berth, keeping its same position, found itself in a bay. Thus began the term sick bay. The first use of this term was in 1813, on board H.M.S. *Namur*, one of the earliest of the round-bowed ships.

LIME JUICER

The expression, "Lime juicer," referring to a British seaman, had its origin in another order of Nelson's. In 1800, as a counteract to scurvy which at that time took such a heavy toll of life at sea, Lord St. Vincent made lime juice an article of diet on his ships. Cook, however, was the first to recognize the value of lime juice on a long voyage, on his second cruise of exploration.

THREE BELLS AT 7:30

The belief that the custom in the British service of striking three bells at 7:30 P.M. had its origin at the time of the Nore Mutiny is discredited by the Society for Nautical Research in London. That society states:

> The sole reason why seven bells are not struck at 7:30 P.M. is that that time occurs during the second dog watch, which commenced at 6:00 P.M. so that the proper number of bells is three. Strictly speaking only four bells should be struck at 8:00 P.M. but as that is the conclusion of the dog watch, it is customary to strike eight bells instead of four. The method of striking the bells must be hundreds of years older than the Nore Mutiny.

NAVAL UNIFORM

A very charming lady was unwittingly responsible for the choice of blue as the color for uniforms of the Royal Navy, and as the American Navy was largely patterned after the British, for the color of ours.

Great diversity of color in dress existed in the British Navy prior to 1745. At that time a meeting of officers decided that "a uniform dress is useful and necessary for the commissioned officers agreeable to the practice of other nations." Various patterns and colors were accordingly prepared for inspection. The final selection was made by the king himself, who having seen the duchess of Bedford riding in a blue habit which greatly took his fancy, designated that color the one to be adopted by the Royal Navy. An order of May, 1748, notified the fleet of this.

Another popular theory exploded by the Society for Nautical Research and one that has gained wide circulation, concerns the uniforms of both British and American seamen. It is often supposed that the black kerchief had its origin as a symbol of mourning for Nelson, and that the three white stripes on the collar commemorate Nelson's victories. This is now disputed by the following facts. The black kerchief is known to have been in use in 1793, and no doubt is much older than that. It was originally worn to prevent the collar of the jacket from being soiled by the seamen's pigtail.

The uniform for seamen was established in the British Navy in 1857. There was, of course, before that time a sort of unofficial costume due to the fact that slop clothing was sold on board ship, but there was nothing before 1857 to force the seamen to buy it and wear it if they did not want to, or to prevent them from ornamenting it in any way they fancied. One of their ways of ornamentation was to sew strips of white material on the collar, and when it was decided to establish uniform regulations the committee suggested that this practice should be standardized, and that the rows should be three in number. In doing this they had no thought of Nelson's victories.

STARBOARD AND PORT

Admiral Penrose Fitzgerald in his memoirs of the sea gives the following reason for the use of the words "starboard" and "port." He states that the English sailors adopted the orders from the Portuguese Tagus River pilots. The prevailing wind in the Tagus is from the north. The pilot used to stand to leeward to see under the belly of the sail and when he wanted the helm over to his side of the ship he gave the order, "Esta Borda" (this way) and when he wanted it up to windward he would say, "Porto."

In the year 1846, while cruising on the coast of Africa, all hands on board an American man-of-war were called to attention and the word was passed, "Do you hear there fore and aft? The word 'larboard' is to be forever dropped in the United States Navy, and the word 'port' is substituted. Any man heard using the word 'larboard' will be punished." This change was made on account of the many accidents that occurred from the similarity of the names starboard and larboard. The change had been ordered in the British Navy some time previous to this.

FLAG SALUTE

The origin of the daily naval salute to the American flag was occasioned by Admiral

James E. Jouett's order of November 22, 1884, which read:

> The attention of the squadron is called to the fact that at colors no custom has hitherto prevailed of giving appropriate recognition, by salute or otherwise, to the flag, the emblem, not only of the national authority at home, but of liberty and progress throughout the world. Under the conviction that such a recognition is fitting and desirable, and that the custom, if adopted by all, should be the spontaneous expression of a general sentiment, the commander-in-chief deems it only necessary to express the wish that on board the ships of the North Atlantic Squadron all officers and men who may be on deck at colors will uncover, as far as practicable without serious interruption to the occupation of the moment.

Superstitions

Not a few customs of ship life are founded on superstition, for seamen have ever been most superstitious. A belief in the virtues of odd numbers was prevalent in the early days of maritime history, and is evidenced in the fact that all national, festal, and personal salutes consist of an odd number of guns. We find that three, seven, nine, and their multiples all were considered lucky.

There is a common idea among sailors that a ship is almost human. "She can do anything but talk, and sometimes she can even do that," said a captain of the Civil War Navy. A commodore in our Navy in the early eighties endorsed this theory, and was known to talk to the mizzenmast of his ship, asking it what sail to carry.

Friday has been universally regarded by seamen of the Christian era as an unlucky day on which to weigh anchor—because of its association with Crucifixion. Originally this day of the week was held a propitious one to set sail on, for it was named in honor of the goddess Freya or Frigga, wife of Odin, and patroness of ships.

Drake's Drum

There is a legend in England that when that country is in danger the ship's drum carried by Sir Francis Drake on his voyage of circumnavigation and upon which his last salute was beaten, can be heard to sound. Drake's drum was heard in 1914 just prior to the outbreak of the World War.

> Drake he was a Devon man, an' ruled the Devon seas,
> (Capten, art tha sleepin' there below?)
> Rovin' tho' his death fell, he went wi' heart at ease,
> An' dreamin' arl the time o' Plymouth Hoe.
>
> 'Take my drum to England, hang et by the shore,
> Strike et when your powder's runnin' low;
> If the Dons sight Devon, I'll quit the port o' Heaven,
> An' drum them up the Channel as we drummed them long ago.'
>
> Drake he's in his hammock till the great Armada's come,
> (Capten, art tha sleepin' there below?),
> Slung atween the round shot, listenin' for the drum,
> An' dreamin' arl the time o' Plymouth Hoe.
> Call him on the deep sea, call him up the Sound,
> Call him when ye sail to meet the foe;
> Where the old trade's plyin' an' the old flag flyin'
> They shall find him ware an' wakin', as they found him long ago!

Scourging Judas

On Good Friday, mariners of Roman Catholic countries still cockbill their yards in mourning and many scourge Judas. The figure of the traitor, hewn out of a block of timber, is carried by chosen members of the crew around the quarter-deck. It is then hanged on the yard arm and each man chants his vituperation as he lashes the figure with a knotted rope. The scourging over, Judas is cut down, thrown upon the deck, spat upon, and kicked into the galley fire where he is burned into a charred mass. The remains are cast into the sea, after which the sailors go to their devotions.

Pelorus Jack

Separating D'Urville Island from the mainland of Nelson Province runs a narrow arm of the sea known as the French Pass. For more than half a century "Pelorus Jack," a dolphin, constituted himself pilot to vessels treading the channel. At the entrance to the Pass "Jack" had his regular quarters and whenever a vessel appeared, he convoyed the ship in safety, swimming just ahead, leaving her only when open water was reached. Once a passenger, having no respect for the veneration "Jack" was held in, shot him with a revolver from a passing steamer and "Jack" retired wounded and bleeding. The obnoxious passenger was only prevented from walking the plank by the prompt action of the skipper, who saved him from the angered crew by locking him up in the ship's strong room for the rest of the voyage. To prevent another such occurrence the English Parliament in 1911 passed a law protecting the life of this famous pilot-fish of New Zealand.

TABOGA BILL

"Taboga Bill," a thirty-two foot shark, who inhabited the waters around Panama for many years was well known to American seamen sailing those waters. He never qualified as a pilot, in fact was more of a liability than asset, for he was bountifully rationed by all ships boasting his acquaintance. The men on approaching Taboga Bill's habitat always kept a sharp lookout for their comrade of the sea.

LASHING BROOM TO FORE-TOPMAST

A custom much favored in the United States Navy is that of lashing a broom to the fore-topmast of a ship when she has made the highest gunnery or engineering record in the fleet, thus indicating her ability to sweep the seas. Von Tromp originated this custom when he sailed to meet Cromwell's fleet. Lashed to the foremast of his flagship was a broom with which he boasted he would sweep the English from the channel.

PENNANTS

In the following year the English fleet defeated the Dutch, whereupon the admiral commanding hoisted a long streamer from his masthead to represent the lash of the whip, signifying that he had whipped his enemies off the sea. Hence the pennant.

The origin of the coach whip and broad pennant used by commanding officers of ships, and the square flag of the admirals of our own and foreign navies has been traced to the days when knighthood flourished. Knights bore a pointed flag or pennon. A squire's mark was a long pennant similar to the coach whip pennant of modern ships of war. Bannerets were of a rank above a simple knight and yet below that of a baron, and carried a knight's pennon slit at the end. Barons were usually created on the battlefield, when the candidate presented his pennon to the king or general, who cut off the train of it, and thus making it square returned it to him as a symbol of his increased rank.

Research has failed to reveal the origin of the ceremony of breaking out the homeward-bound pennant. When a ship of the English-speaking navies, after a long cruise in foreign waters, weighs anchor for her home port the crew hoist aloft a pennant distinctly their own. It is often two hundred feet long with a bladder on the end to make it float, although its length is frequently decided by allowing a foot for each member of the crew.

Now that lengthy naval cruises are infrequent the stirring sight of the homeward bounder flying aloft is a rare one.

WETTING A COMMISSION

A custom made a tradition in the United States Navy by General Order No. 99 is that of *wetting a commission.* This, a naval custom of long standing in American and British navies, usually means that when an officer is promoted from one grade to another he by popular tradition, on that auspicious occasion, supplies his mess with champagne. The ceremony has at times been celebrated by making a cornucopia of the commission and drinking the wine from the parchment.

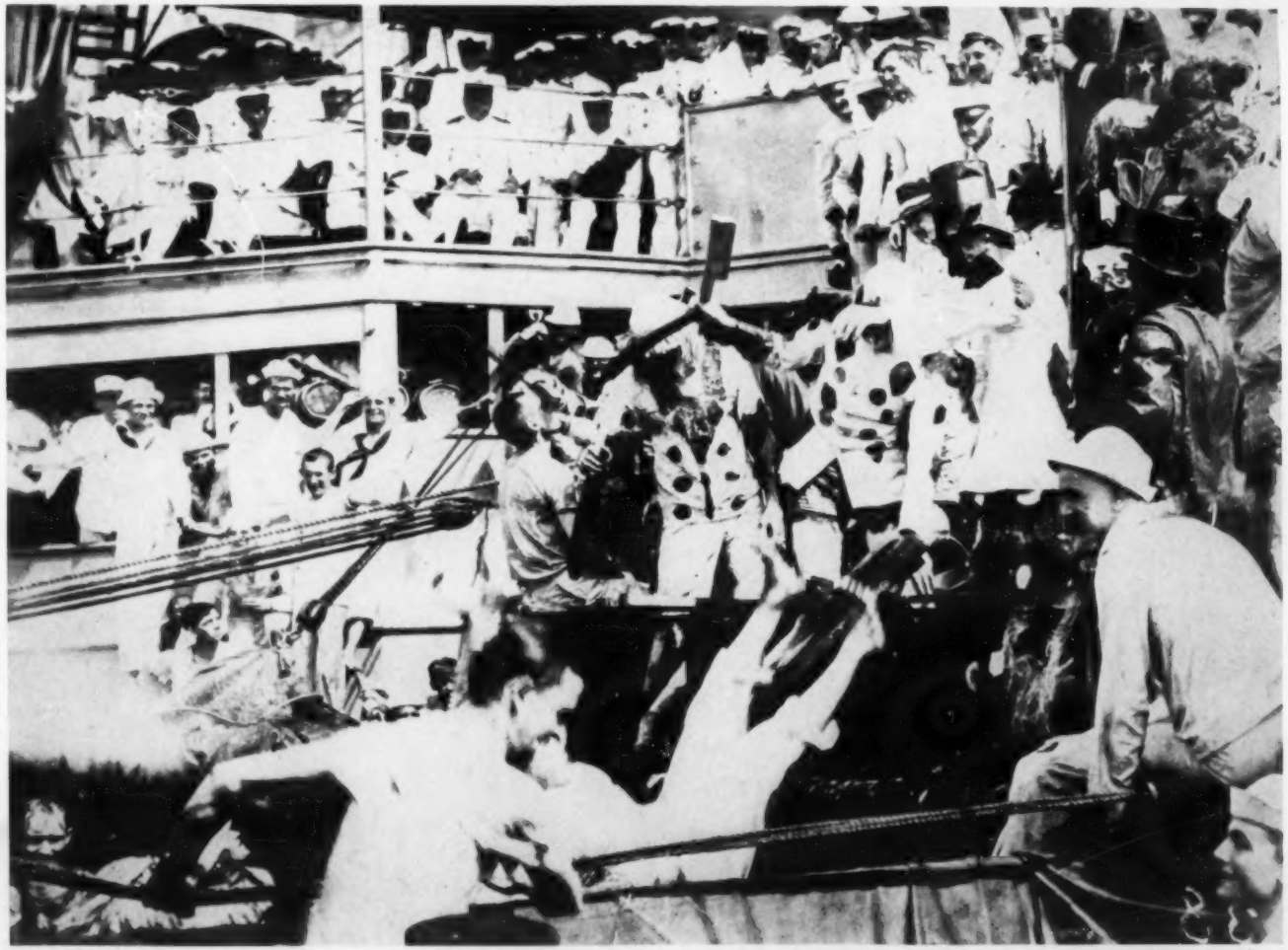
In collecting data for this article the following item came to light, which seems to establish the origin of this ceremony:

> In 1826 there existed in England a tax payable on officers' commissions. This tax proved a great hardship upon officers, especially when appointed to a ship on half pay. On every commission issued, or appointment made out by the Admiralty there is a separate tax payable by the officer. Even a midshipman, on being appointed a lieutenant, was so assessed.

It is not unreasonable to suppose that the practice of "wetting a commission" grew from the earlier one when the tax was imposed by the Admiralty.

These are but few of the seagoing customs which are so much a part of life at sea; a life in which exists customs and traditions utterly unique, founded on discipline, courage, superstition, fear of that uncertain element, the sea, and good-natured fun.

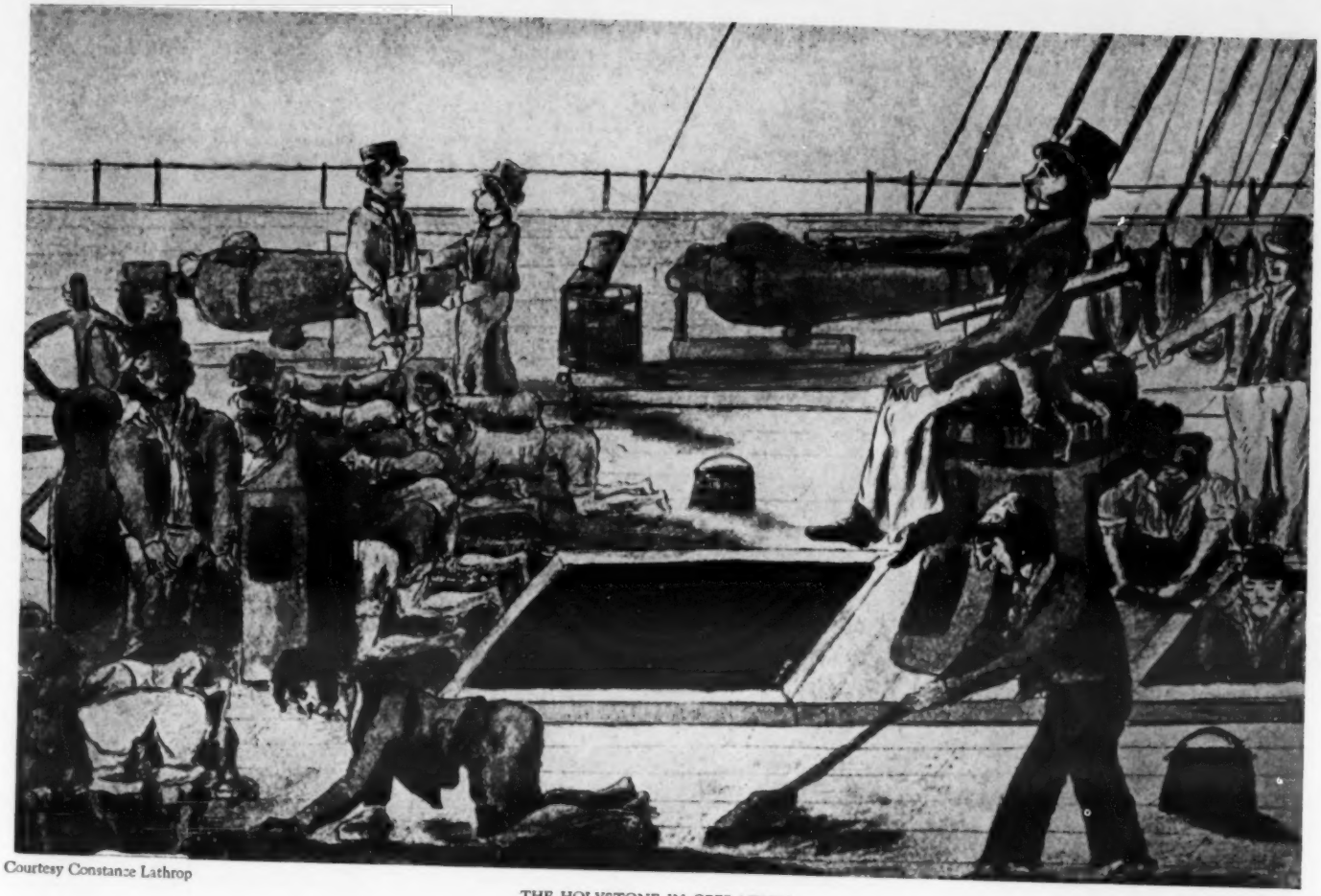
The origins of the many more customs not here mentioned are so obscure and have become such an integral part of life aboard ship that the writer has been unable to trace their beginnings. They belong to that interesting aspect of maritime history which is perpetuated by word rather than by record.



Courtesy Constance Lathrop

CROSSING THE LINE, U.S.S. *CONNECTICUT*

Cruise around the world; the neophytes are seen being shaved and dumped into the tank to be manhandled by the mermaids. Admiral Evans is sitting on the lower bridge looking on.

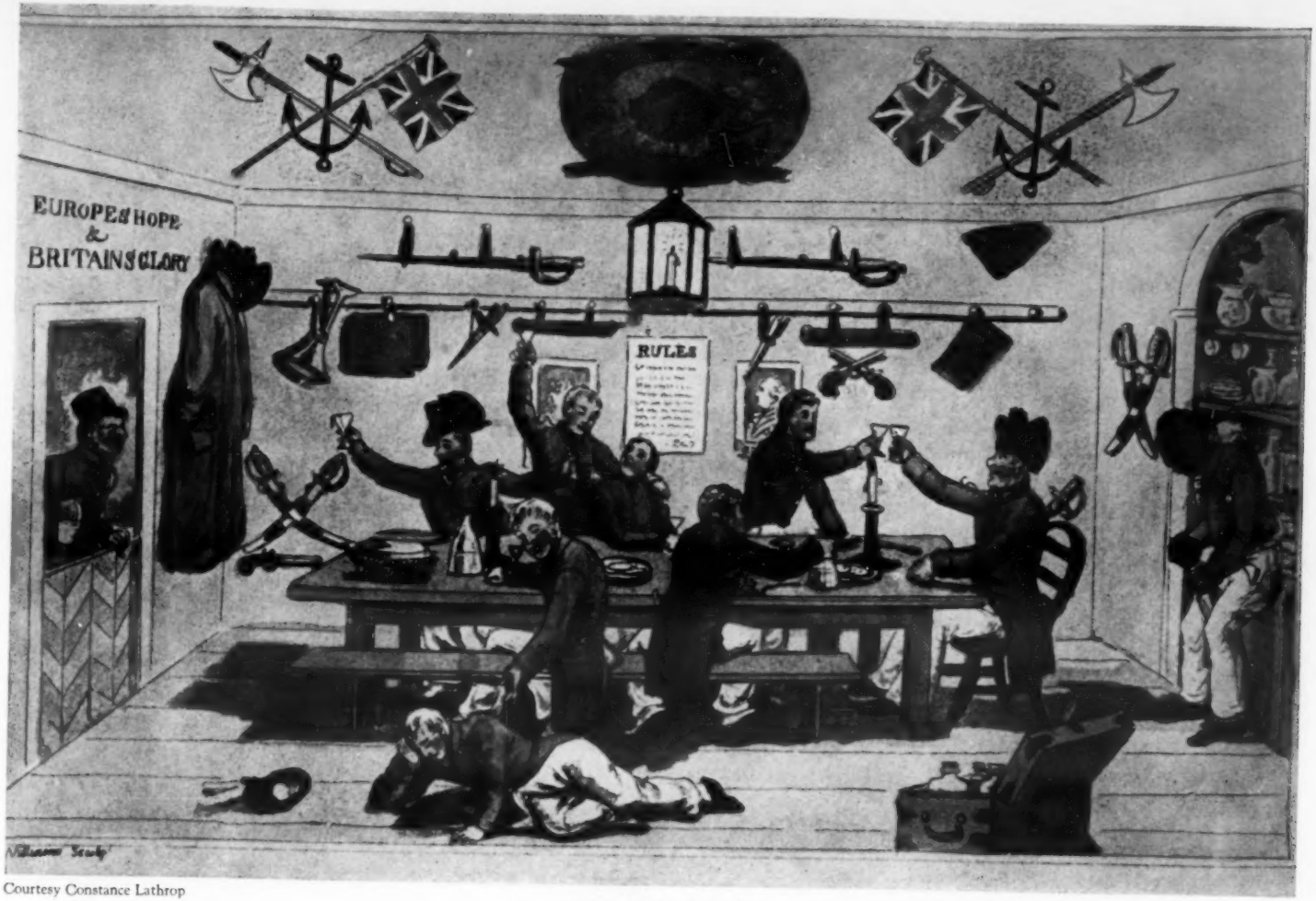


Courtesy Constance Lathrop

THE HOLYSTONE IN OPERATION

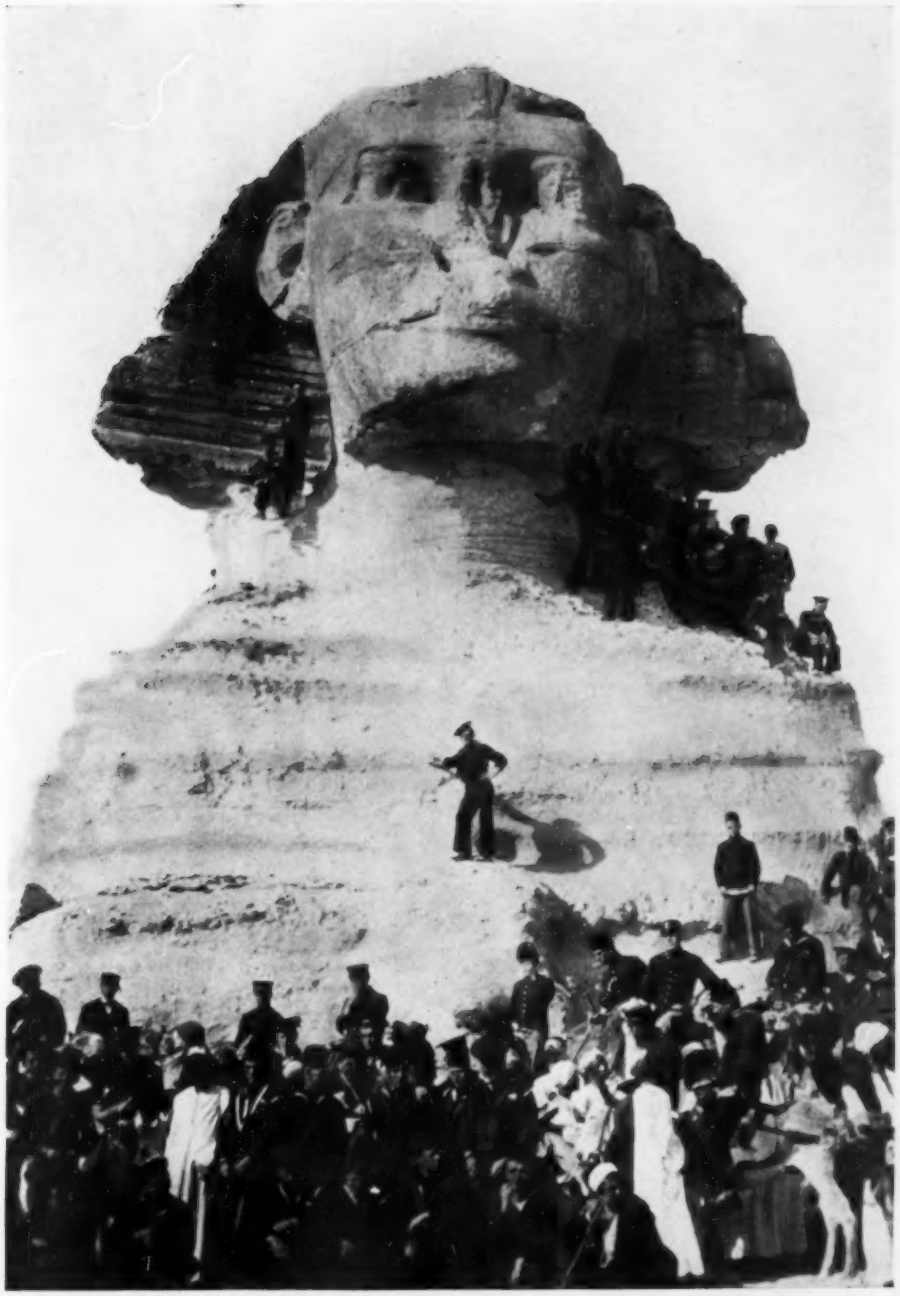
Courtesy Constance Lathrop. From *Illustrated London News.*

SAILORS CELEBRATING THE COMPLETION OF THE FIRST FIVE WEEKS OF LONG VOYAGE



Courtesy Constance Lathrop

MIDSHIPMAN'S BERTH



Courtesy the late Mrs. G. E. T. Stevenson

THE SPHINX, 1909

Twenty years ago this month the battleships reached Suez and the Mediterranean on their cruise around the world.

Courtesy the late Mrs. G. E. T. Stevenson

AN UNUSUAL VIEW OF THE PYRAMIDS, 1909

Underwood and Underwood

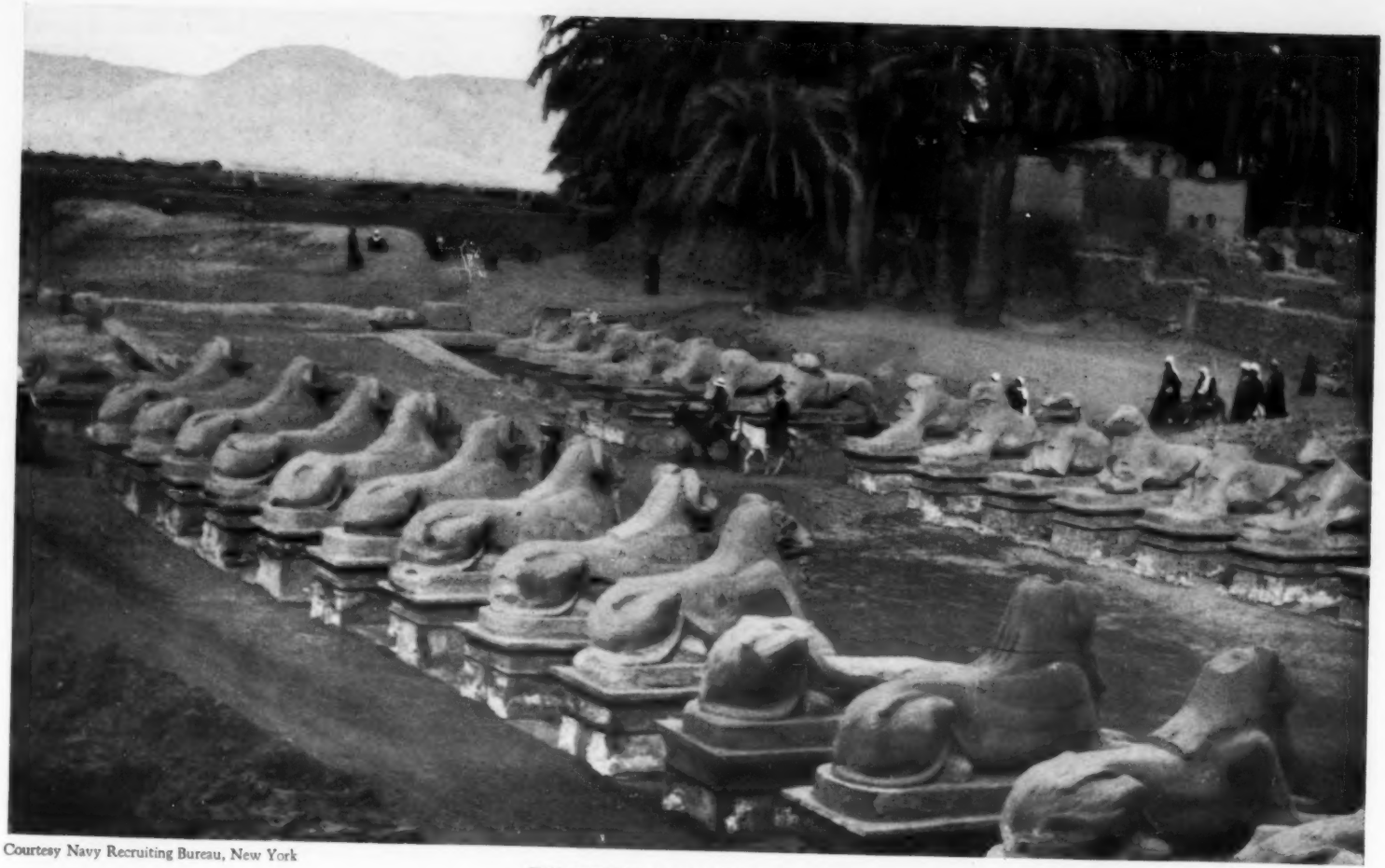
BLUEJACKETS AND MARINES AT THE SPHINX IN 1909

Courtesy Navy Recruiting Bureau, New York

RUINS OF KING RAMESES II TEMPLE, LUXOR, EGYPT

Courtesy Navy Recruiting Bureau, New York

KING RAMESES II TEMPLE, LUXOR, EGYPT

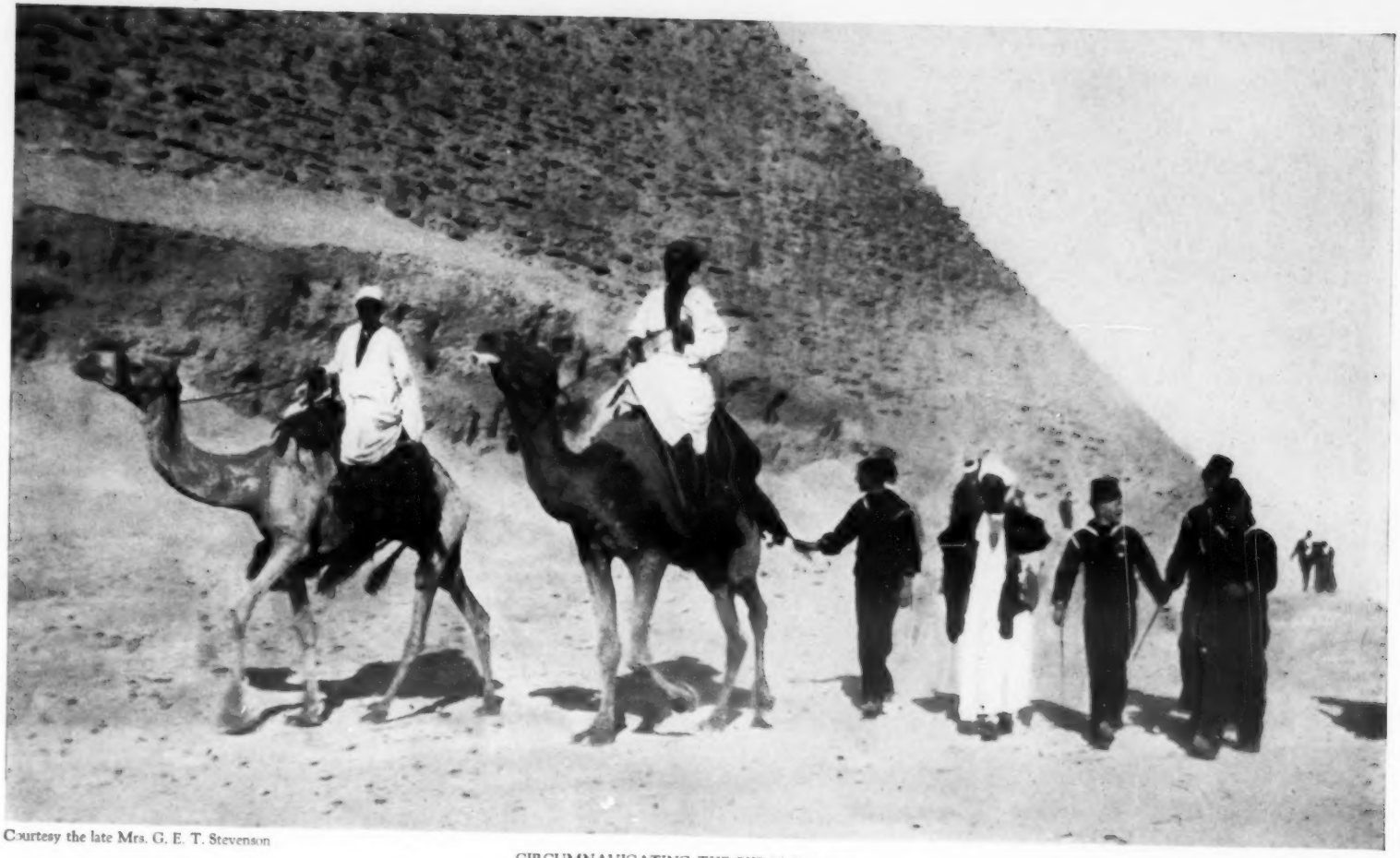


Courtesy Navy Recruiting Bureau, New York

THE AVENUE OF THE SPHINXES, EGYPT

Courtesy Navy Recruiting Bureau, New York

SMALL EGYPTIAN VILLAGE IN THE VALLEY OF THE KINGS ON THE WAY TO KING TUT'S TOMB

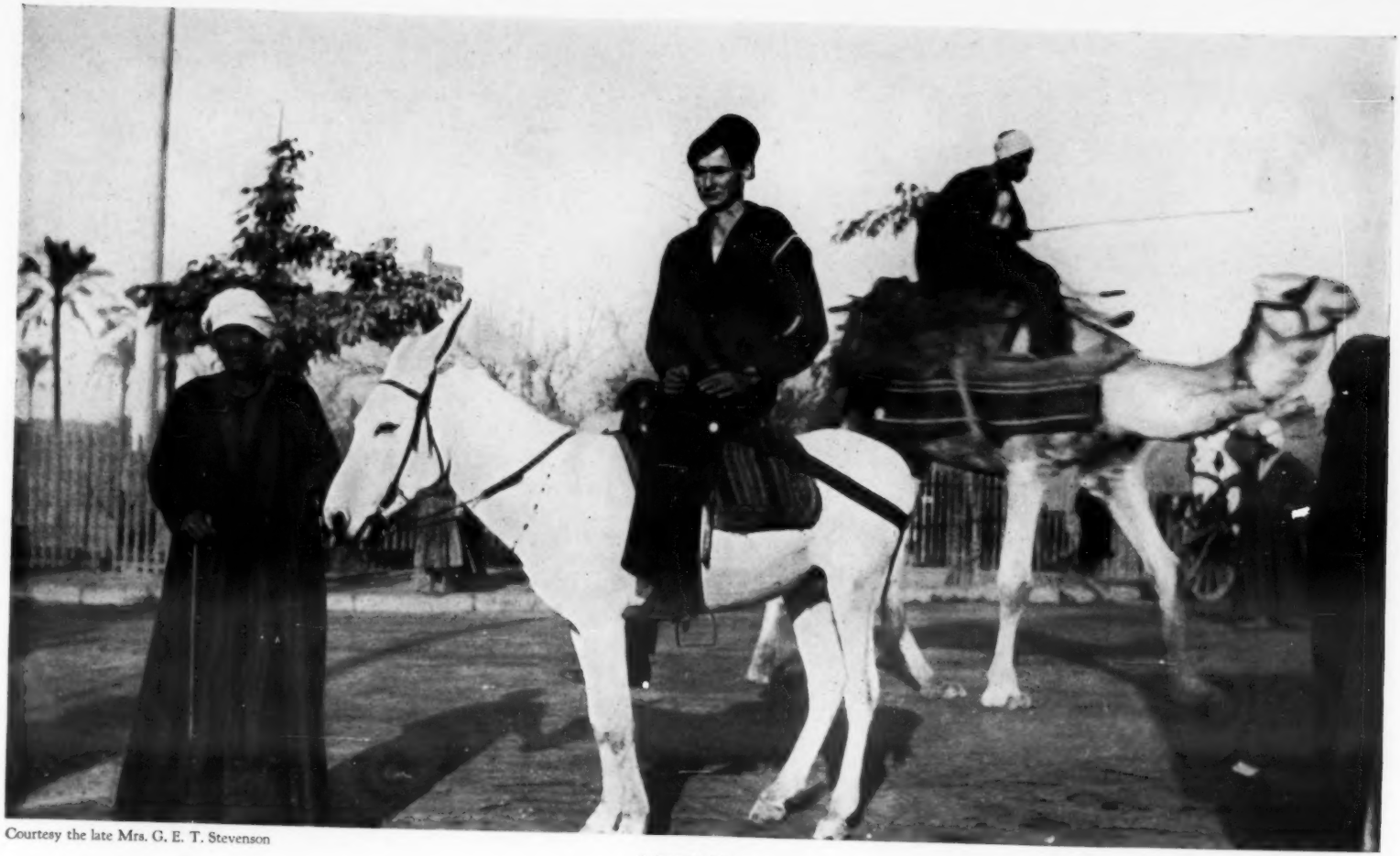


Courtesy the late Mrs. G. E. T. Stevenson

CIRCUMNAVIGATING THE PYRAMIDS, 1909

Courtesy the late Mrs. G. E. T. Stevenson

HIGH, LOW, JACK, AND THE GAME



Courtesy the late Mrs. G. E. T. Stevenson

WHITE MULE!

Courtesy Navy Recruiting Bureau, New York

THE STEPS OF SOLOMON'S TEMPLE, JERUSALEM
In 1909 trips were made to the Holy Land from Alexandria.

Courtesy Navy Recruiting Bureau, New York

SPOT BELIEVED TO HAVE BEEN THE SITE OF THE CRUCIFIXION OF CHRIST

Gyroscopes *and* Satellites

Speculations in Support of the Egyptian and Chinese Traditions that in Remote Ages the Sun Rose in the West

By GEORGE L. DILLMAN

THE basic principle operating gyroscopic compasses seems not put into operation in its greatest simplicity. The principal manufacturers all constrain their axes to the horizontal plane. Constraint introduces precessional tendencies, requiring complicated and expensive compensations and adjustments. From this the natural inference is that the principle is not wholly understood by the manufacturers. The purpose of this article is to explain the principle and to show its applications to other things.

First, the principle, the Law of Satellites. Any body, given rotation about an axis through its center of gravity (making it a gyroscope) and revolution about some other axis (making it a satellite), will seek, as a position of stability, its axis of rotation perpendicular to its plane of revolution, with rotation and revolution in the same direction.

The law applies to all satellites that have rotation, both natural and artificial. The orbs of the solar system are natural and uncontrollable in those two motions. Gyrocompasses are natural in their revolution, being due to the diurnal rotation of the earth. Their rotation is artificial, therefore controllable. Gyroscopic tops, mounted as satellites, are artificial in both motions, therefore controllable. Tops perform in a few minutes; they are easily seen. Gyrocompasses take a few hours; not so easily seen but just as certain. The earth has been at it for several hundred thousand years and is still in progress.

As the Law of Satellites and its application are entirely foreign to college curricula, proofs seem *en règle.* They are simple and many. There is no fact that contradicts. There are "erroneous conclusions from insecure premises" that contradict, but not one established fact.

1. PHYSICAL ANALYSIS. Consider the spinner (any satellite, top, compass, moon, planet, etc.), divided by an axial plane at right angles to the axial plane through the center of revolution. There is thus an inner and outer half. Each particle of one half has a velocity of revolution plus a component of the velocity of rotation. Each particle of the other half has a velocity of revolution minus a component of the velocity of rotation. The two halves, by reason of their different velocities, have different centrifugal pulls.

There is thus set up a couple, with generally an arm, making a moment, an outside force acting on the gyroscope. This moment inverts the axis of rotation when rotation is retrograde, or opposite the direction of revolution. Inversion changes retrograde to forward rotation. After which the same moment erects the axis to the orbital plane.

The mass of each half can be considered as concentrated at the center of gyration of each half. The arm becomes zero when the two centers of gyration and the center of revolution are in line. That occurs twice in each revolution and is permanent when the axis of rotation becomes parallel to the axis of revolution. At all other times, there is an arm, therefore a moment, which inverts and erects, according to the law of satellites.

2. VISUAL PROOF. Any gyroscope, mounted in gimbals, with the gimbals on an arm, making it an artificial satellite, when rotated and revolved, will perform according to the Law of Satellites. With retrograde rotation, the first performance is to invert the axis. Inversion changes retrograde to forward rotation. The axis will then erect to the plane of revolution, continuing forward rotation. The demonstration is quite spectacular.

The accompanying illustration is of such a toy, which spins for fifteen minutes with one winding, inverts and erects several times as retrograde rotation is given by changing the direction of revolution. It will invert several times after the spin force is too small to erect.

3. PRESUMPTIVE PROOF. All the planets, nearly all the moons, of the solar system, have attained forward rotation. Many axes are nearly perpendicular to their orbital planes. Such a common effect can hardly arrive except as the result of a common cause. The Law of Satellites is submitted as the common cause.

4. MEASUREMENTS, IN THE CASE OF THE EARTH. The inclination of the earth's axis, or the obliquity of the ecliptic, is the most important angle in the universe to an astronomer. It has been measured many times. Records show a rising axis. These measurements are submitted.

1. Tchou Kong, 1100 B.C., 23° 54′, computed by Laplace, 1811.
2. Eratosthenes, 229 B.C., 23° 46′, from recent Britannicas.
3. Al Bategnius, 891 A.D., 23° 36′, various publications.
4. Inclination now, 1925 A.D., 23° 27′, most observatories on earth.

These are days of relativity. There is relative motion between the axis of the earth and the ecliptic. Arguing from analogy, the axis rises rather than the ecliptic changes. Just as the rotation of the earth is simpler than the earth at rest, with a geocentric universe revolving around it. Reason is the great test of truth.

Though slow, these and other measurements show a rising axis for as long as measurements have been recorded. Considering the range of time and the crudity of early instruments, the rate is remarkably even.

5. LEGENDS. The Chinese have legends that the equator was once perpendicular to the ecliptic and that, prior to that time, the sun rose in the west. (From recent encyclopedias.)

Herodotus records that, on one of his visits to Egypt, a priest of that country told him the sun formerly rose in the west. It was so improbable that its effect was to make Herodotus a liar, till the Law of Satellites was discovered.

Legends add little proof to anything. These legends bolster each other and are corroborated by the law deduced. Legends and folklore are interesting. In this case, it is pertinent to the Law of Satellites, not as proving the law, but as being proved by the law.

So much for the Law of Satellites. It applies to many things. The earth's axis has inverted and is now being erected to the ecliptic. The sun rose in the west many hundred milleniums longer than it has risen in the east.

Computations of dates of performance are simple, long winded, therefore tedious. When finished, they look like one of Bowditch's tables. The data of inclinations are all inside thirty minutes. The data of times extend a little over 3,000 years. Not a large arc to extend to a semicircle. Not a long time to extend several hundred thousand years each way. Yet results are more satisfactory than other attempts at reckoning dates of past and future events.

The premises used are:

1. The inclination in 250 B.C. was 23° 46′.
2. The inclination now, 1925 A.D. *is* 23° 27′.
3. The rate of rising varies as the sine of the angle of inclination. From which, the time of rising, say 1°, varies inversely as the sine.

The first two premises are from hearsay. They have to be. The third is from pure reason. Anybody can make it. Any mathematician will make it, if he will consider it a few minutes.

The known rate of rising (250 B.C. to 1925 A.D.) is 1° in 6,870 years. The inclination averages 23°36′.5. The sine of the inclination is .40048. Then, by the rule of three, get the time of rising 1° for other inclinations. By addition and subtraction, the date of any inclination can be found. Here are some results:

Axial inclination 179° 30′. Date 1,092,000 B.C. Previous to then, there had

been no winter and no summer. However long the earth had existed, or when its axis had left perpendicularity to the ecliptic, it had reached only thirty minutes from it at that date. The axis can never regain perpendicularity, because the couple had acquired an arm to form the moment, which must invert and erect the axis, according to the Law of Satellites. The sun rose in the west, as it had through all former time. The poles were in perpetual sunlight. There were polar ice caps that didn't fluctuate.

Axial inclination 156° 33′. Date 494,000 B.C. Climate as today. Sometime in the

past 600,000 years, the earth had acquired climate, winters and summers, as we have them now. Weather affected human activities, if there were human activities. The sun rose in the west. The polar caps advanced in the winter and receded in the summer, as they do now.

Axial inclination 135°. Date 385,000 B.C. Former temperate zones obliterated. Frigid

and torrid zones just met at lines of 45° latitude in each hemisphere. Winter was cold and growing colder. Summer was hot and growing hotter. The sun still rose in the west.

Thenceforth, the frigid and torrid zones overlapped, the overlap increasing with axial rise. The arctic and antarctic circles were approaching the equator, where they were to meet, then recede, never to meet again.

Axial inclination 90°. Date 246,000 B.C. Overlap of frigid and torrid zones complete, one hundred per cent or from pole to pole.

The earth's axis was in the ecliptic. Each pole was in sun six months, in shade six months, every year. In the middle of the summer, the sun was at the zenith of the pole and within fifteen degrees of the zenith for a month, with no night. Torridity was

DATES OF VARIOUS INCLINATIONS OF THE EARTH'S AXIS FROM LONG BEFORE GLACIATION TO MAXIMUM GLACIATION, AND TORRIDITY

Angle	*Interval*	*Date*	*Angle*	*Interval*	*Date*
179° 30′		1,092,318 B.C.	135°	3,924 years	384,736 B.C.
179°	105,060 years	987,258 B.C.	134°	3,856 years	380,880 B.C.
178°	105,070 years	882,188 B.C.	133°	3,792 years	377,088 B.C.
177°	63,053 years	819,135 B.C.	132°	3,730 years	373,358 B.C.
176°	45,052 years	774,083 B.C.	131°	3,672 years	369,686 B.C.
175°	35,055 years	739,028 B.C.	130°	3,617 years	366,069 B.C.
174°	28,696 years	710,332 B.C.	129°	3,564 years	362,305 B.C.
173°	24,296 years	686,036 B.C.	128°	3,514 years	358,991 B.C.
172°	21,071 years	664,965 B.C.	127°	3,464 years	355,524 B.C.
171°	18,607 years	646,358 B.C.	126°	3,421 years	352,103 B.C.
170°	16,664 years	639,694 B.C.	125°	3,378 years	348,725 B.C.
169°	15,092 years	614,602 B.C.	124°	3,337 years	345,388 B.C.
168°	13,795 years	600,807 B.C.	123°	3,298 years	342,090 B.C.
167°	12,707 years	588,100 B.C.	122°	3,261 years	338,829 B.C.
166°	11,781 years	576,319 B.C.	121°	3,226 years	335,603 B.C.
165°	10,985 years	565,334 B.C.	120°	3,192 years	332,411 B.C.
164°	10,292 years	555,042 B.C.	119°	3,160 years	329,251 B.C.
163°	9,684 years	545,358 B.C.	118°	3,130 years	326,121 B.C.
162°	9,146 years	536,212 B.C.	117°	3,101 years	323,020 B.C.
161°	8,668 years	527,544 B.C.	116°	3,073 years	319,047 B.C.
160°	8,239 years	519,305 B.C.	115°	3,047 years	316,900 B.C.
159°	7,853 years	511,452 B.C.	114°	3,023 years	313,877 B.C.
158°	7,504 years	503,948 B.C.	113°	2,999 years	310,878 B.C.
157°	7,187 years	496,761 B.C.	112°	2,977 years	307,901 B.C.
156° 33′	3,138 years	493,623 B.C.	111°	2,956 years	304,945 B.C.
156°	3,759 years	489,864 B.C.	110°	2,936 years	302,009 B.C.
155°	6,632 years	483,232 B.C.	109°	2,918 years	299,091 B.C.
154°	6,389 years	476,843 B.C.	108°	2,900 years	296,101 B.C.
153°	6,164 years	470,679 B.C.	107°	2,884 years	293,307 B.C.
152°	5,956 years	464,723 B.C.	106°	2,869 years	290,438 B.C.
151°	5,764 years	458,959 B.C.	105°	2,854 years	287,584 B.C.
150°	5,585 years	453,374 B.C.	104°	2,841 years	284,743 B.C.
149°	5,419 years	447,955 B.C.	103°	2,829 years	281,914 B.C.
148°	5,264 years	442,621 B.C.	102°	2,817 years	279,097 B.C.
147°	5,119 years	437,572 B.C.	101°	2,807 years	276,290 B.C.
146°	4,983 years	432,589 B.C.	100°	2,797 years	273,493 B.C.
145°	4,856 years	427,733 B.C.	99°	2,789 years	270,704 B.C.
144°	4,736 years	422,997 B.C.	98°	2,781 years	267,923 B.C.
143°	4,624 years	418,373 B.C.	97°	2,774 years	265,149 B.C.
142°	4,518 years	413,855 B.C.	96°	2,768 years	262,381 B.C.
141°	4,418 years	409,437 B.C.	95°	2,763 years	259,618 B.C.
140°	4,324 years	405,113 B.C.	94°	2,759 years	256,859 B.C.
139°	4,235 years	400,878 B.C.	93°	2,756 years	254,103 B.C.
138°	4,151 years	396,727 B.C.	92°	2,753 years	251,350 B.C.
137°	4,071 years	392,656 B.C.	91°	2,751 years	248,599 B.C.
136°	3,996 years	388,660 B.C.	90°	2,750 years	245,849 B.C.

Reaching maximum glaciation, maximum torridity, maximum rate of erection of the earth's axis, one hundred per cent overlap of frigid and torrid zones. The axis is in the ecliptic. The polar circles are at the equator.

DATES OF VARIOUS INCLINATIONS OF THE EARTH'S AXIS FROM MAXIMUM GLACIATION AND TORRIDITY TO CESSATION OF SEASONS

Angle	*Interval*	*Date*	*Angle*	*Interval*	*Date*
90°		245,849 B.C.	43°	3,996 years	99,042 B.C.
89°	2,750 years	243,099 B.C.	42°	4,071 years	94,271 B.C.
88°	2,751 years	240,348 B.C.	41°	4,151 years	90,820 B.C.
87°	2,753 years	237,595 B.C.	40°	4,235 years	86,595 B.C.
86°	2,756 years	234,830 B.C.	39°	4,324 years	82,261 B.C.
85°	2,759 years	232,080 B.C.	38°	4,418 years	77,843 B.C.
84°	2,763 years	229,317 B.C.	37°	4,518 years	73,325 B.C.
83°	2,768 years	226,549 B.C.	36°	4,624 years	68,701 B.C.
82°	2,774 years	223,775 B.C.	35°	4,736 years	63,965 B.C.
81°	2,781 years	220,994 B.C.	34°	4,856 years	59,109 B.C.
80°	2,789 years	218,205 B.C.	33°	4,983 years	54,126 B.C.
79°	2,797 years	215,408 B.C.	32°	5,119 years	49,007 B.C.
78°	2,807 years	212,601 B.C.	31°	5,264 years	43,743 B.C.
77°	2,817 years	209,784 B.C.	30°	5,419 years	38,324 B.C.
76°	2,829 years	206,955 B.C.	29°	5,585 years	32,739 B.C.
75°	2,841 years	204,114 B.C.	28°	5,764 years	26,975 B.C.
74°	2,854 years	201,260 B.C.	27°	5,956 years	21,019 B.C.
73°	2,869 years	198,391 B.C.	26°	6,164 years	14,855 B.C.
72°	2,884 years	195,507 B.C.	25°	6,389 years	8,466 B.C.
71°	2,900 years	192,607 B.C.	24°	6,632 years	1,834 B.C.
70°	2,918 years	189,689 B.C.	23° 46′	1,584 years	250 B.C.*
69°	2,936 years	186,753 B.C.	23° 36′	1,141 years	891 A.D.†
68°	2,956 years	183,797 B.C.	23° 27′	1,034 years	1,925 A.D.*
67°	2,977 years	180,820 B.C.	23°	3,138 years	5,063 A.D.
66°	2,999 years	177,821 B.C.	22°	7,187 years	12,250 A.D.
65°	3,023 years	174,798 B.C.	21°	7,504 years	19,754 A.D.
64°	3,047 years	171,751 B.C.	20°	7,853 years	27,807 A.D.
63°	3,073 years	168,678 B.C.	19°	8,239 years	35,846 A.D.
62°	3,101 years	165,577 B.C.	18°	8,668 years	44,514 A.D.
61°	3,130 years	162,447 B.C.	17°	9,146 years	53,660 A.D.
60°	3,160 years	159,287 B.C.	16°	9,684 years	63,344 A.D.
59°	3,192 years	156,095 B.C.	15°	10,292 years	73,636 A.D.
58°	3,226 years	152,869 B.C.	14°	10,985 years	84,621 A.D.
57°	3,261 years	149,608 B.C.	13°	11,781 years	96,402 A.D.
56°	3,298 years	146,310 B.C.	12°	12,707 years	109,109 A.D.
55°	3,337 years	142,973 B.C.	11°	13,795 years	122,904 A.D.
54°	3,378 years	139,595 B.C.	10°	15,092 years	137,996 A.D.
53°	3,421 years	136,174 B.C.	9°	16,664 years	154,660 A.D.
52°	3,467 years	132,707 B.C.	8°	18,607 years	173,287 A.D.
51°	3,514 years	129,193 B.C.	7°	21,071 years	194,338 A.D.
50°	3,564 years	125,629 B.C.	6°	24,296 years	218,634 A.D.
49°	3,617 years	122,012 B.C.	5°	28,696 years	247,330 A.D.
48°	3,672 years	118,340 B.C.	4°	35,055 years	282,385 A.D.
47°	3,730 years	114,610 B.C.	3°	45,052 years	327,437 A.D.
46°	3,792 years	110,818 B.C.	2°	63,053 years	390,490 A.D.
45°	3,856 years	106,963 B.C.	1°	105,070 years	495,560 A.D.
44°	3,924 years	103,038 B.C.	0° 30′	105,060 years	600,620 A.D.

The earth's axis will have reached practical perpendicularity to the ecliptic. No more winter. No more summer. Perpetual spring. Every day an equinox. The tropical circles are at the equator.

* A premise. † A check.

awful, difficult to conceive from present experience. Evaporation was enormous. Winds were fierce, carrying the evaporated moisture toward the shaded pole. The sun, having risen in the west through all previous time, changed to rising in the east, which it will continue to do till the end of time or the earth.

At the shaded pole, there was glaciation. Six month's night. Great precipitation, all snow. Maximum torridity at one pole was contemporaneous with maximum frigidity at the other. They changed places every year.

Between an awful winter and a frightful summer, land animals had a hard time of it. Sea denizens were not so much affected. Changes in temperature were not so great. Ocean currents helped and they could migrate. Birds learned to migrate, which they still do. Man had control of fire, which helped him and his companion, the dog, through those long, hard winters. The ordinary land animal couldn't move fast enough to get away from the terrible extremes. Bears hibernated, but many whole species became extinct. Thenceforth, the overlap of zones decreased.

Axial inclination 45°. Date 107,000 B.C. Overlap of frigid and torrid zones ceased. The present temperate zones began, lines

of 45° latitude in each hemisphere. Climate severe but growing milder. Thenceforth the temperate zone widened at the expense of the frigid and torrid zones. The widening will continue till the frigid zones will be wiped out and the torrid zone reduced to the angular diameter of the sun.

Axial inclination 23° 27′. Date 1925 A.D., now. Climate as readers of the Naval In-

stitute PROCEEDINGS know it, varying with the altitude and latitude, modified by ocean currents, prevailing winds, and topography.

Axial inclination 0° 30′. Date 600,000 A.D. Practical perpendicularity. Each pole

in perpetual sunshine, partly by reason of atmospheric refraction. No winter. No summer. Perpetual spring. Every day an equinox. Seasons will have ceased. "As it was in the beginning", it will be then, "and ever more shall be".

Impressing a force to change the direction of the axis of a gyroscope results in a greater movement at right angles to the impressed force. This is so much in evidence that the direct motion is often overlooked. The real movement is the component of a small direct motion and a comparatively large indirect one. Such performance is common to all gyroscopes, natural and artificial.

The impressed force is the moment, heretofore described. In the case of the earth, the direct movement is the rising axis. It amounts now to 1° in about 6,870 years. The indirect movement is the precession of the equinoxes. It amounts now to 1° in about seventy-two years, or ninety-five times the rate of the rising axis. The precession of the equinoxes was discovered by Hipparchus in the second century before Christ. It was enough to be noted by observation at that time. Variously computed from discrepant observations, astronomers quite generally agree on its amount now.

Known, recorded, recognized measurements of the axial inclination of the earth began about a thousand years before precession was discovered. The axis rises so slowly that it is generally unknown and ignored. It is directly connected with precession. They have a common cause. Physical analysis proves it. Any gyroscope, mounted and operated as an artificial satellite, visualizes it.

The "Precessional Circle" is not quite a circle. It is a contracting spiral, about the pole of the ecliptic, with which the pole of

the earth and the celestial pole will ultimately coincide.

These investigations indicate a possible improvement in gyro-compasses. Any gyroscopic compass is an artificial satellite of the earth. Rotation and revolution invoke the Law of Satellites. By observation and analysis of the effects of those motions, the law was discovered.

Physically, it makes no difference whether the force that changes linear into circular or elliptical motion be the pull of gravity, the tension of a rod, a chain or a string. Any balanced rotor, with three freedoms, is the rotating body. The diurnal motion of the earth furnishes the revolution.

When unconstrained, the axis of the rotor will become parallel to the axis of the earth. In azimuth, it will point true north. In tilt, it will point the latitude. The axes are usually (the author knows of no exception) constrained to the horizontal plane. Any gyroscope, with any constraint, will develop precessional tendencies, which need attention, to avoid errors.

Some of the errors, adjustments, and compensations may be avoided by letting the axis tilt. A well-adjusted compass will give the latitude by measuring the tilt, with a vertical circle. This is not proposed as a method of finding latitude. It is the best method of testing the balance of the compass.

By avoiding damping, the latitude error will be obviated. The ballistic deflection, the quadrantal error and the centrifugal forces are due to pendulous construction, which will be cured by eliminating the cause.

The north and south steaming error can not be avoided. The north or south components of any course change the actual axis of revolution from the earth's axis, so must be reckoned with.

Unless there is some unconsidered reason for continuing the pendulous construction, the apparent purpose of which is to constrain the axis to the horizontal plane, the author suggests a balanced construction.

The Distribution *of* Shots *in* Long-Range Salvos

By COMMANDER G. L. SCHUYLER, *U. S. Navy*

MOST gunnery textbooks lead one to believe that the range distribution in a group of shots fired under conditions as nearly alike as possible, is always a symmetrical distribution typified by a pure probability curve like Figure 1. With this the MPI is obviously the best part of the group to put on the target.[1]

FIG. I

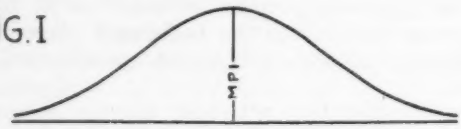
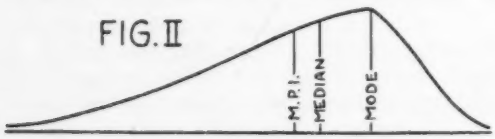


FIG. II



But in modern long-range gunnery it is becoming increasingly evident that this classic theory is not entirely applicable because in general the actual range distribution of such shots is frequently an unsymmetrical distribution typified by a curve like Figure 2.[2] With distributions of this sort, the MPI is obviously *not* the best part of the group to put on the target.

Shots tumble "short" rather than "over," and it is easier to imagine something going wrong with the flight of a projectile and causing a certain decrease in range, than it is to imagine an analogous effect causing an equal increase in range. The part of the dispersion caused by flight characteristics is therefore not safely assumed to be of symmetrical distribution. It may be expected generally to show a preponderance of "shorts."

In firings at very small ranges where flight characteristics contribute only a relatively minor part of the dispersion (which total dispersion is then caused principally by the symmetrical velocity variations) it is not surprising to find that dispersions are very nearly symmetrically distributed. But to get any general rule, particularly any rule applicable to present-day conditions, results of firings at extreme ranges must also be taken into account.

For example, par. 1615 of *Exterior Ballistics*, 1926, gives in support of Figure 1, data now nearly fifty years old, showing the distribution in deflection of shots fired from a 4.7-inch gun at a range of 3,000 yards. As one might expect, these data from firings at such a small range show practically a symmetrical distribution of shots. Furthermore, the distribution of such shots could be expected to be more nearly symmetrical in deflection than in range.

Possibly this last throws some light on why those who continue to use these particular firing data in support of Figure 1 prefer to deal with deflection results rather than with range results. For they must have had range results also, and it would seem more natural to have used them had they supported Figure 1 as well as deflection results did. Furthermore, why should any of these data, which are probably of greater age than the reader, be now used if examples from modern firings will serve the same purpose?

So in this, and in other stock examples in the textbooks, there is little evidence to impress one that Figure 1 holds very closely for modern long-range firing, but much to make one suspect that it does not. Thus in

[1] "The maximum probability of hitting, i.e., the greatest percentage of hits, will occur when the MPI is at the center of the danger space of the target." Par. 1616, *Exterior Ballistics*—Herrmann, 1926.

[2] Compare, "An Introduction to the Theory of Statistics"—Yule, 1919, figs. 21 and 22.

modern long-range gunnery, where flight characteristics contribute a fairly large and an unsymmetrical part of the total dispersions, it is not surprising frequently to find range dispersions fairly unsymmetrical and represented by the family of curves which Figure 2 typifies. Under modern conditions Figure 1 seems, therefore, only the limiting case to which the more general family of curves typified by Figure 2 finally reduces as the range shortens so as to make range distribution more and more symmetrical.

The present-day statistician, when studying variations, approaches his subject open-mindedly with the idea of finding what sort of distribution exists. He accepts a symmetrical distribution only after proving he actually has one.[3] So in this idea of unsymmetrical range distribution there is no novel thought which need surprise one. In fact it is the other way round—the surprising thing being rather that writers have clung so long to the assumption of necessarily symmetrical range distributions while apparently disregarding much of the ballistic data obtained under the very changed conditions of present-day gunnery.

Unsymmetrical variations are thoroughly treated in standard textbooks on statistics.[4] There are three sorts of "centers" which a group of this kind may be considered as having.[5] One is the simple "mean," or the MPI commonly used in dealing with positions of the shots of a salvo. Another is the "median," which has equal numbers of points each side of it, e.g., in a twelve-gun salvo the median is halfway between the shots which are sixth and seventh in order of range. In a nine-gun salvo the median is at the impact of the shot which is fifth in range. The other sort of "center" is the "mode," or the point on each side of which the density of points systematically decreases.

In illustration of these terms we could, in speaking of ages in a large community, refer to the "mean" age of individuals, or refer to the "median" age (which exactly half the time is exceeded) or refer to the "modal" age (which is the age of the most numerous age group). And in general these three figures would not be identical, for they correspond exactly with one another only in the case of symmetrical distributions which do not in general exist. In Figure 2 the ordinate through the MPI passes through the center of gravity of the curve's area, the ordinate through the median bisects the curve's area, while the ordinate through the mode is the curve's maximum ordinate.

In general, the mode, and not the MPI, is obviously the best part of the group to put on the target. But with the small number of shots in a salvo, one has not the same escape from the capricious workings of chance that he would have in dealing with very extensive data (e.g., age groups in a large community). A mode from two shots falling together at one end of a salvo would hardly indicate the ideal part of the group to spot on the target, because that particular agreement of ranges came probably from workings of chance not very likely to be approximated in the next salvo, nor even in the average salvo. The real average mode or the true mode which we wish to spot on the target is, therefore, not at all well directly indicated by the intervals between impacts in any one salvo. But we can know the true mode's position indirectly from a steady approximate relation which holds between its average position and the not very variable relative positions of the MPI and of the median. At any rate, we can locate it sufficiently accurately to serve our present purpose.

The average mode lies on the same side of the MPI that the average median does, but is about three times as far away from the MPI.[6] Thus, although the median is not the ideal part of the salvo to put on the target, it is at any rate better for this purpose than the MPI. Since no single salvo is likely to directly indicate the true mode by the intervals in the small number of impacts in that one salvo, about the best one can do in spotting is to use the median.

Can our spotters, in the few seconds they take to announce spots, be really judging the position of the MPI by some instinctive sort of true averaging process? Probably not. But since they are called upon to spot the MPI, they cannot be expected to go very far

[3] *Memoriale de l'Artillerie Française, 1926,* p. 336, shows for instance, the unsymmetrical variations of the barometer.

[4] Yule, chapters on Frequency-Distribution and on Averages, particularly pp. 108, 116 and 120.

[5] See Century Dictionary (Supplement) for definitions of "mean," "median" and "mode" as used in statistical work.

[6] Yule, page 121, and Figure 2 opposite.

in voluntarily admitting such inability. If there are "doubtful" shots at the ends of the pattern there is insufficient time to apply any good criterion for retaining or for rejecting such shots. It is very hard to say what goes on in one's mind in a process which has to be so nearly instantaneous.

But it seems no great reflection on spotters to suspect that what they really do is about as accurately described by saying that they spot the "50-50" point in a salvo as it would be by saying that they spot its MPI—or in other words, say that something which is practically median spotting is of necessity probably already with us, although not officially admitted.

Enough has been said to show, however, that far from having to feel apologetic about the use of the median, even in theory also this practice is to be preferred.[7] The median coincides with the MPI when, with symmetrical distributions, the MPI is the proper thing to use. And at all other times the median lies even closer to the true mode than the MPI does.[8] One practical advantage of using the median is that it saves the spotter worry about rejecting or retaining doubtful shots at the ends of pattern.

We could therefore, rewrite in more honest and in simpler terms much that existing textbooks say about spotting salvos by their MPI's, and so legitimatize a kind of spotting which should not only be better, but which probably anyway is in actual use.

An extension of these ideas to one other matter appears logical. Since the median seems the better part of the salvo to put on the target, the "range" defined by it (instead of by the MPI) should be better to use in analysis of proving-ground and of target-practice results.[9] Not only would the theoretical basis then be quite as sound or sounder than it is now, but possibly much numerical work could be saved.

[7] Compare Improvement Firing in field artillery work.

[8] Even if one claims Figure I can be verified by experiment (*Memoriale de l'Artillerie Française*, 1926, p. 456) this can be no basis for objecting to using the median in spotting.

[9] *Revue d'Artillerie*, 15 May, 1926, "Introduction to a rational theory of the errors of observation." In this, General Estienne, by different reasoning, reaches a similar conclusion.

The Importance *of* Dead Reckoning *in* Aerial Navigation

By LIEUTENANT L. C. RAMSEY, *U. S. Navy*

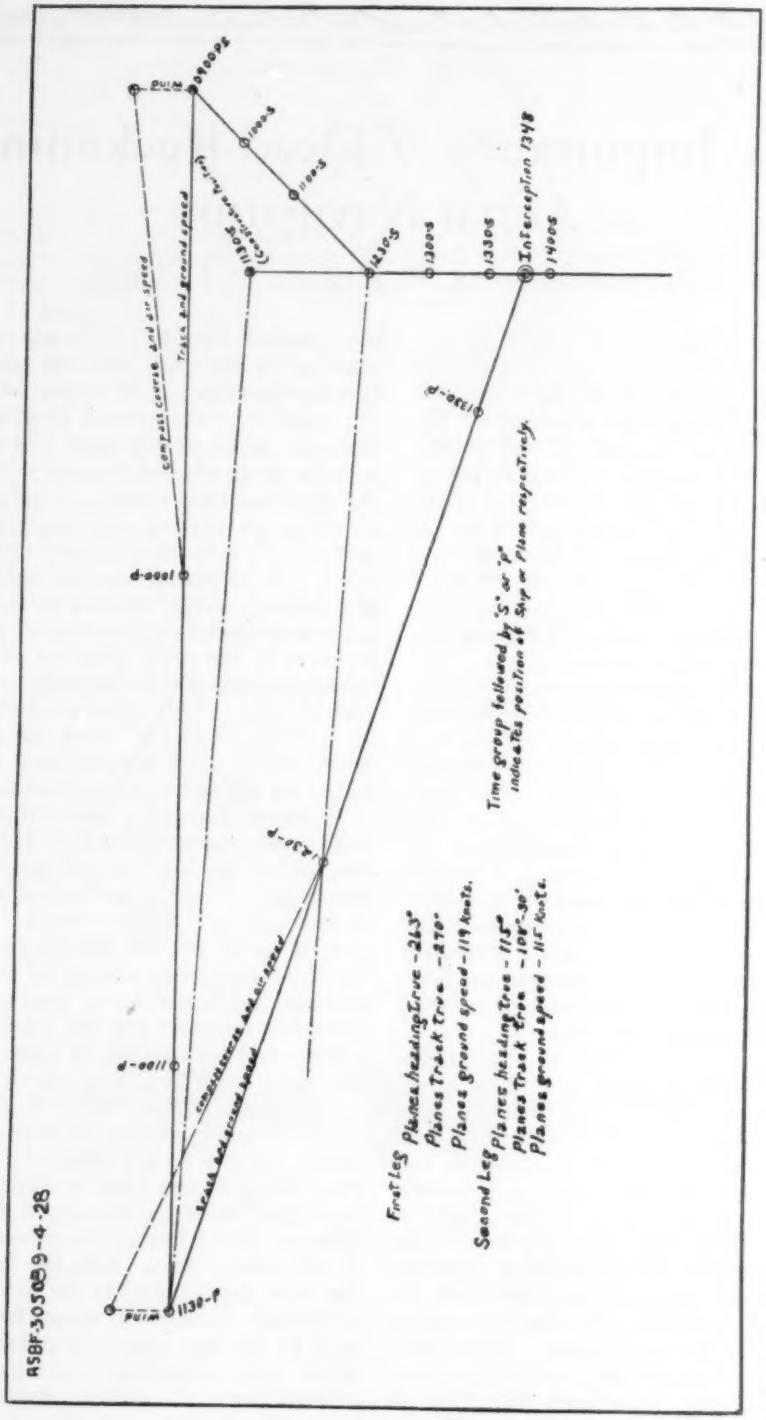
WHILE a number of noted navigators, not only in the service but throughout the world, have directed their talents towards the solution of the problems of aërial navigation, yet almost without exception they are concentrating on the simplification of the solution of astronomical observations. Apparently they assume that dead reckoning will be simple and accurate as well as easily plotted. Unfortunately this is not the case, at least for the type of problems that will be encountered in the immediate future.

The difficulties which the aërial navigator encounters in working out his dead reckoning are worthy of exposition. In the first place no wholly satisfactory aërial compass has yet been placed in service. The magnetic types, necessarily limited as to size and weight, are relatively sluggish and the maintenance of an accurate compass course, particularly in rough air, requires considerable experience. Other types more satisfactory in this respect have faults peculiarly their own. The gyroscopic compass has been up to the present impracticable for aërial use due to the weight involved.

Even if a perfect course is steered the plane will deviate from the line of the heading if the wind is not exactly parallel. The surface navigator, out of sight of land, neglects the possible effects of currents, unless in some recognized and well-known current such as the Gulf Stream, until a fix indicates their force and direction. The aërial navigator, on the other hand, must be cognizant at all times of the force and direction of the currents affecting his course and on the alert for any change. The winds, too, are more variable than ocean currents. To determine the force and direction of the wind, the naval aviator has several different types of instruments, most of them merely indicating the angle of drift from the compass heading. Under such conditions, while the track over the ground is ascertainable with a fair degree of accuracy, the speed over the ground is within certain limits a matter of estimate. The dropping of a smoke bomb and its observation on two different courses after a definite time interval is at present the most satisfactory method of determining the force of the wind. In addition, as the aerodynamical and military characteristics must receive the primary consideration in aircraft design, the location of the drift indicator is frequently unsatisfactory due to interference along the line of sight. This often necessitates flying on a different course from the desired one while taking drift observations, which adds to the complexities of the dead reckoning.

Were the foregoing difficulties absent the dead reckoning would still present complexities which the surface navigator does not encounter. First is the limited space which is available in which to work. The cockpits of naval aircraft hardly provide room for the comfortable seating of the pilot, and even in the larger types where other locations are available for the taking of observations and for plotting of results, the aërial navigator is physically cramped.

Next is vibration, which is seldom mentioned as being among the difficulties of the aërial navigator, but which is a very real one. Under even ideal working conditions care must be taken in using a drafting machine or parallel rulers to prevent a slipping of the ruler. In a plane the hand of even the most experienced in the use of these instruments sometimes resembles that of a man in the last stages of palsy. Accuracy under such conditions is obviously difficult of attainment. A further complication arises from the high speed of modern aircraft, necessitating the drawing, particularly in interception problems which in carrier opera-


Interception 1348
1330-P
1430-P
1100-P
1000-P
First Leg Planes heading True - 243°
Planes track True - 270°
Planes ground speed - 119 knots.
Second Leg Planes heading True - 115°
Planes Track True - 108°-30'
Planes ground speed - 117 knots.
Time group followed by "S" or "P" indicates position of Ship or Plane respectively.
Compass course and air speed
Track and ground speed
ASBF-305089-4-28

tions will be of invariable occurrence, of very long lines to indicate tracks and courses. The length of these lines will frequently exceed twenty-four inches on the standard scale plotting sheets issued by the Hydrographic Office. The use of a greatly reduced scale chart is almost mandatory, with the resultant loss of accuracy.

One might deduce from these various difficulties that aërial dead reckoning is inaccurate in comparison with that of surface vessels. Absolutely this is true. Relatively and under average weather conditions it is not. Take for example the classic instance of aërial dead reckoning out of sight of land. Colonel Lindbergh's close adherence to the great circle course between Cape Race and Land's End with only compass, chart, pencil and timepiece as navigational equipment is indicative of the possibilities.

Under average conditions and with the present equipment, equally good results can be obtained by experienced personnel. The degree of accuracy necessary in aërial navigation is not limited as in surface navigation to a mile or two but is equal to the radius of visibility from the plane. Under low visibility conditions the permissible error is of course comparable to that which obtains in surface craft and is the ideal towards which all efforts should be aimed.

The attainment of proficiency to this degree requires, among other things, experience. Unfortunately, opportunity for practice is very limited. Employment schedules provide adequate chance for training in airmanship, aërial tactics, and gunnery, but aërial navigation must be done incidentally. It therefore devolves on naval aviation to utilize to the fullest the few opportunities that do occur. Cross-country and passage flights should be utilized to the fullest. On these flights, except on the rare passage flights that are made out of sight of land, there is the ever present temptation to be guided solely by landmarks, instead of flying compass courses and estimating or ascertaining the wind and its effect on track and ground speed. Flights out of sight of land are best of all, but due to the increasing percentage of land planes, are seldom made.

With the advent of the carriers and carrier operations this may be changed, as the necessity and importance of aërial navigation will become even more apparent, and with it that of aërial dead reckoning. In such operations the importance of this phase of navigation cannot be overestimated. In keeping track of the position of aircraft it is immediate, available, and accurate.

The same advantages cannot be claimed for aërial navigation by means of celestial observations, for most military operations by naval aircraft. In the first place, this means of keeping track of the position is available only in the larger types of planes. In a single-place plane it is practically impossible for the pilot to take the necessary observations and at the same time handle the controls. Only dead reckoning can be attempted and that of the most elementary character. For the smaller two-seaters the same is substantially true except that astronomical observations would be within the realm of possibility if the navigator should happen to be a fairly adept contortionist. Only in the larger types does this form of aërial navigation seem at all feasible. Navigation by observation is available only to one-third of all naval aircraft.

Celestial observations, even to that small percentage of the total aërial force of the Navy, are of lessened value for flights of less than about one thousand miles except when simultaneous observations are available. Seven hours is roughly the maximum duration in the air of the planes at present designed to accompany the fleet. Under certain conditions, with flights thus limited in time, only one line of position can be used advantageously at a time, unless the dead reckoning is sufficiently accurate to render the second line (brought forward from a previous observation) merely a matter of precaution. When the change in azimuth between two lines is small the acuity with which the lines intersect introduces a considerable error in the fix obtained, if the error in the reckoning between the two dead reckoning positions is at all considerable. The dead reckoning error between two positions as close together as one hour frequently amounts to two miles or more, due to slight errors in steering, coupled with the high speed of the plane, slight shifts in force or direction of the wind, and other causes. Under these circumstances the fix obtained may be further from the true position than is the dead reckoning, if the angle of intersection between the two lines is less than say thirty-five degrees. Of course

the fix so obtained will indicate fairly closely the direction of the true position from the dead reckoning position, and with lines so closely parallel, a point midway between the two will be frequently close to the true position.

Obviously, at night where simultaneous observations are possible, an accurate fix is readily obtainable. However as the scouting value of aircraft at night has not yet been thoroughly demonstrated it seems reasonable to assume that the great majority of flights during which navigation of any sort will be necessary will be acomplished during daylight. Under these conditions primary dependence must be placed in the dead reckoning.

It must not be construed from the foregoing that the writer is attempting to decry the merits of celestial navigation for aircraft. For shore-based planes capable of flights of relatively great duration, whose war-time mission will be essentially a straight line flight from the base to the previously determined or reported enemy position, an attack, and then a straight line flight back to the base, the value of this type of navigation is comparable to that which obtains on surface craft. This alone would render necessary on the part of the naval service the utmost effort towards the development of simplified methods of taking and using celestial observations, applicable particularly to aircraft, and render ridiculous any attempt to disparage their utility. What it has been attempted to demonstrate is that for fleet aircraft, i.e., planes carried on board vessels of the fleet, primary dependence must be placed in dead reckoning at least for the present; that to enable these planes to operate to greatest advantage all possible efforts should be made toward improving methods and equipment for dead reckoning; and that the training of pilots for these planes should be conducted with this principle in mind.

The following example is included with the assumption that it is typical of the navigational problems that aircraft carrier planes will encounter in actual war. We may assume that the apparently radical change in course and speed of the carrier is necessitated by a change in fleet formation subsequent to the receipt of a contact report, and the recall of planes from scouting by a desire to refuel them and have them in readiness for the expected action.

EXAMPLE

An aircraft carrier in Lat. 22-00-00 North, Long. 145-00-00 West, and steaming on course 225 true at eighteen knots, dispatches a scouting plane at 0900 with orders to scout on bearing 270 true until 1400 and then return to the ship. At 1130 the carrier radios to the plane orders to return immediately and informs the plane that at 1230 she will change course to 180 true and increase speed to thirty knots. Wind south, fifteen knots. Cruising air speed of plane 120 knots.

Required: Compass courses of plane on each leg and time of interception of carrier.

Before leaving the carrier the pilot of the plane would lay down on his chart the entire problem which would be a simple problem of interception with the 1400 positions of the carrier and plane as origins. The plane's heading out would be 263 true with a ground speed of 119 knots. Theoretically the heading would be 262-49 true, and the speed 118.8 knots, but these differ so slightly from those given that the errors must be disregarded, even though at 1400 the true position would be approximately two miles farther north and five miles farther east than the dead reckoning position, assuming the force and the direction of the wind to have been constant.

The unforeseen change in course and speed of the carrier would necessitate the plotting in the air of what amounts to a new problem. The change in course and speed of the carrier, coming as it does after the plane starts back, but prior to its arrival at the carrier, requires the pilot of the plane to disregard the ship's actual position at 1130 and plot his interception with his own true position at 1130 and a constructive 1130 position for the carrier as origins. This constructive position is the 1130 position of the carrier had it been steaming on the line that it would be following after 1230 at thirty knots. (See graphic solution).

The plane headings and the time of interception are required because these are of more importance to the plane from a navigational standpoint than geographical positions; the headings because they are the compass courses the plane must actually fly; and the time of interception because the plane on account of fuel supply or military necessity must know as soon as possible whether the carrier has been missed.

The United States Naval Observatory, Washington, D. C.

A National Institution

COMPILED BY MEMBERS OF THE OBSERVATORY STAFF

THE mission of the U. S. Naval Observatory, Washington, D.C., is to make such astronomical observations, to derive and publish such data, and to arrange for the supply of such nautical instruments, as will afford to United States naval vessels and aircraft, as well as to all availing themselves thereof, means for safe navigation, including the provision of accurate time, and, while pursuing this primary function, to contribute material, within the capabilities of the available astronomical equipment, to the general advancement of navigation and astronomy.

The idea of establishing a national observatory was brought to the attention of Congress in 1809 by an amateur astronomer, William Lambert, who suggested the establishment of a first meridian in the United States at the seat of government. The appeals of Lambert, and those of John Quincy Adams, as President and as a member of Congress, and of the Secretary of the Navy, for an observatory to secure accurate positions of the heavenly bodies and to increase knowledge by discovery, were unheeded by Congress until 1842. In the meantime the Secretary of the Navy, in 1830, ordered the establishment of a depot of charts and instruments, to be in charge of Lieutenant L. M. Goldsborough, U. S. Navy, for the purpose of assembling and caring for the nautical instruments, books, charts, and chronometers not in use but to be issued to naval vessels. The rating of chronometers and the correction of their errors required the use of a transit instrument, which was secured and mounted. In 1833, Lieutenant Goldsborough was succeeded at the depot by Lieutenant Charles Wilkes, U. S. Navy, who increased the facilities for time derivation. In 1837, Lieutenant Wilkes was relieved at the depot by Lieutenant J. M. Gilliss, U. S. Navy, and was ordered upon survey and exploration work. Lieutenant Gilliss, by authority of the Secretary of the Navy, secured sufficient equipment for, and commenced, in 1838, continuous observations in astronomy, magnetism, and meteorology.

In 1842, Congress authorized a "suitable house for a depot of charts and instruments," thus permitting the expansion of the services of the depot, particularly in astronomy. The depot was located at the site of the present naval hospital on Twenty-fourth Street, N.W., its functions being hydrographical as well as astronomical.

Lieutenant M. F. Maury, U. S. Navy, relieved Lieutenant Gilliss in 1842, and commenced his great work in hydrography which resulted in the *Wind and Current Charts,* the beginning of these useful charts which finally covered every navigable sea. The benefit to navigation and commerce of Lieutenant Maury's investigations have been of lasting and universal value.

In 1846, the Secretary of the Navy approved the course being pursued by the observatory in making the series of astronomical observations necessary for the preparation of a nautical almanac and the employment of the spare time of observers and instruments for the general advancement of astronomy.

The first *American Ephemeris and Nautical Almanac* was issued in 1852, for the year 1855. The hydrographic work of the observatory was transferred in 1866, and assigned to the then newly established Hydrographic Office, Navy Department. The observatory, however, retained all of its astronomical functions and those func-

tions concerned with the procurement and repair of nautical instruments for the use of the Navy, and with the supplying of the correct time.

By the time of the removal of the observatory to its present site in 1893, its work in astronomy had placed it in the first rank of then existing observatories.

The present site is circumscribed by a circle of a 1,000-foot radius about a clock house. This distance from street traffic and external disturbances was decided upon as a safeguard against vibrations which might affect the standard clocks and astronomical instruments of precision, and is assured by a provision of the federal law of the United States.

Through the time service rendered by the observatory, longitude determinations are readily obtained not only by navigators, but also by scientific investigators and by surveyors, many of whom are actively at work for various governmental departments.

The Navy has a primary interest in the maintenance of a thoroughly up-to-date national observatory concerned with the astronomy of position, because it is by means of this and the data of nautical almanacs obtained from it, that deep-sea navigation is rendered possible, time is derived, and maritime independence along navigational lines is secured. It follows, therefore, that, in addition to the preparation and publication of the *American Ephemeris and Nautical Almanac*, the derivation and dissemination of correct time, and the procurement and repair of nautical instruments, the field of the observatory comprises the astronomy of position, continuous observations of the sun, moon, planets, and fundamental stars for the determination of absolute positions, including the position of the equator and the equinox among the stars, and essential contributory observations. Other astronomical investigations of general or special scientific value, either independently or in coöperation with other observatories, are undertaken, so far as time and opportunity permit.

About three thousand visitors annually view the heavens through the Naval Observatory telescopes. The increasing interest in astronomy is apparent in the increasing requests for cards of admission to the observatory.

Accompanying this article are photographs and descriptions of some of the most important instruments in use at the observatory, including the 26-inch Equatorial, the 6-inch Transit Circle, the Altitude-Azimuth Instrument, and the Time-Service Transmitting Clock.

Others, not shown, are:

Nine-inch Transit Circle.—This instrument made by Pistor and Martins, was mounted in 1865 and has been in almost continuous use since that date. It does work similar to the 6-inch Transit Circle, observing the heavenly bodies during their transit across the meridian for accurately determining their positions. Aperture, 9 inches; focal length, 108 inches.

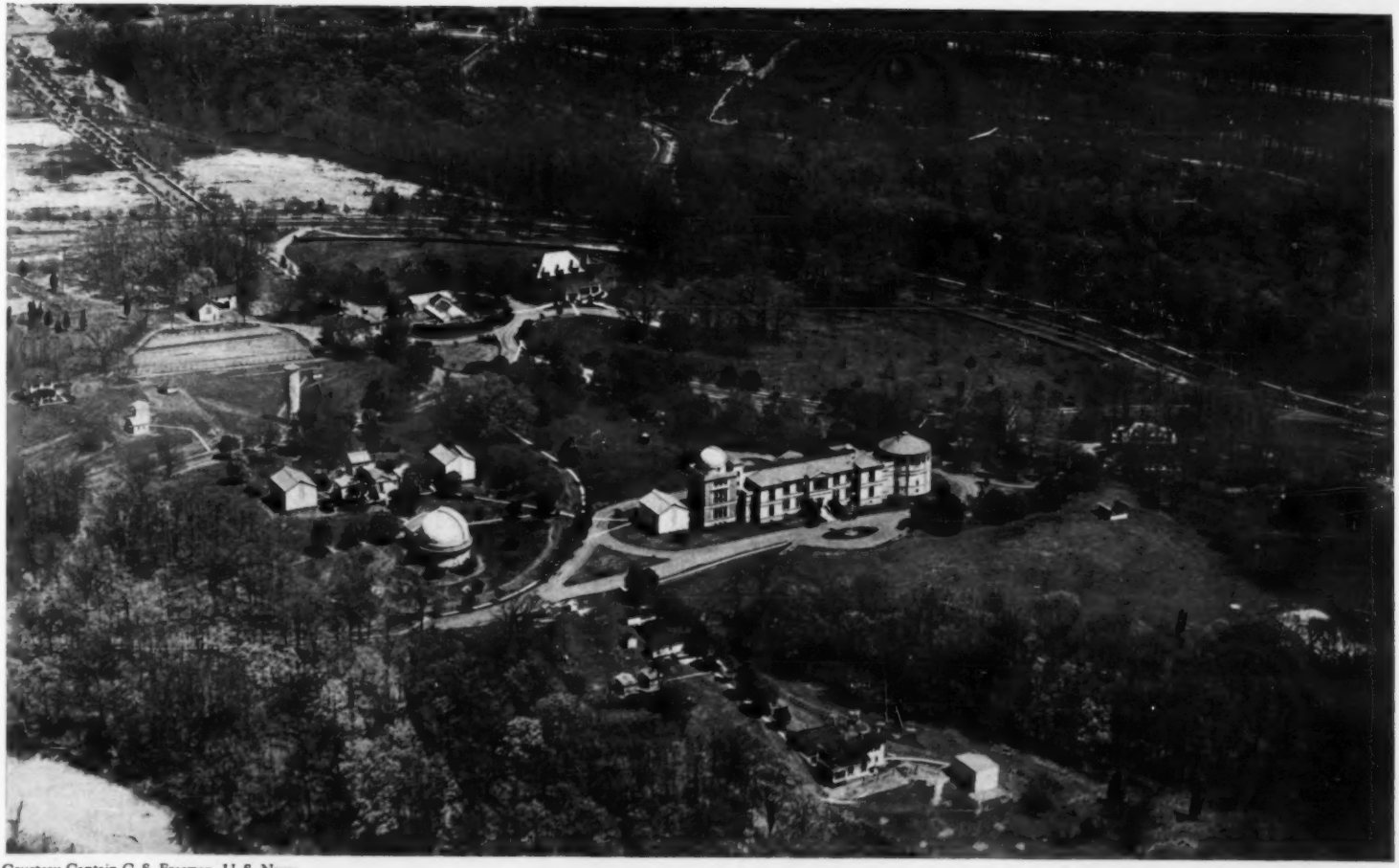
Zenith Tube.—This photographic reflex instrument, devised by Dr. Ross, was made in 1911 by Gaertner. The objective, which has an aperture of 8 inches and a focal length of 17 feet, was made by Petitdidier. The telescope is mounted vertically and is immovable. It is used to photograph stars as they pass near the zenith, in order to determine the variation of latitude. This variation of latitude is used in correction of all observations for declinations.

Photoheliograph.—This instrument is for taking daily photographs of the sun. The diameter of the solar image is about 4.2 inches. The objective has an aperture of 5 inches and a focal length of about 40 feet. Negatives are measured for positions and areas of sun spots and groups, which data are used in the study of magnetic disturbances supposed to be related to sun spots.

Photographic Equatorial.—The guiding telescope has an object glass of 9.6 inches and a micrometer. The photographic lenses are 10-inch triple twin lenses of 113 inches focal length. Its work is principally the observation of asteroids (minor planets) for position. Several new asteroids have been discovered with this instrument.

Prin Portable Transit Instrument.—This is the type of instrument used by expeditions requiring accurate time. Two of these little transits of 3-inch aperture and 33-inch focal length, made by Prin of Paris, were used in longitude operations at Paris and Washington in 1913-14, and at San Diego and Washington in 1926. One of them is now being used regularly for time determinations for the daily time signals. It is provided with a motor-driven self-registering micrometer by which the personal equation of the observer is practically eliminated.

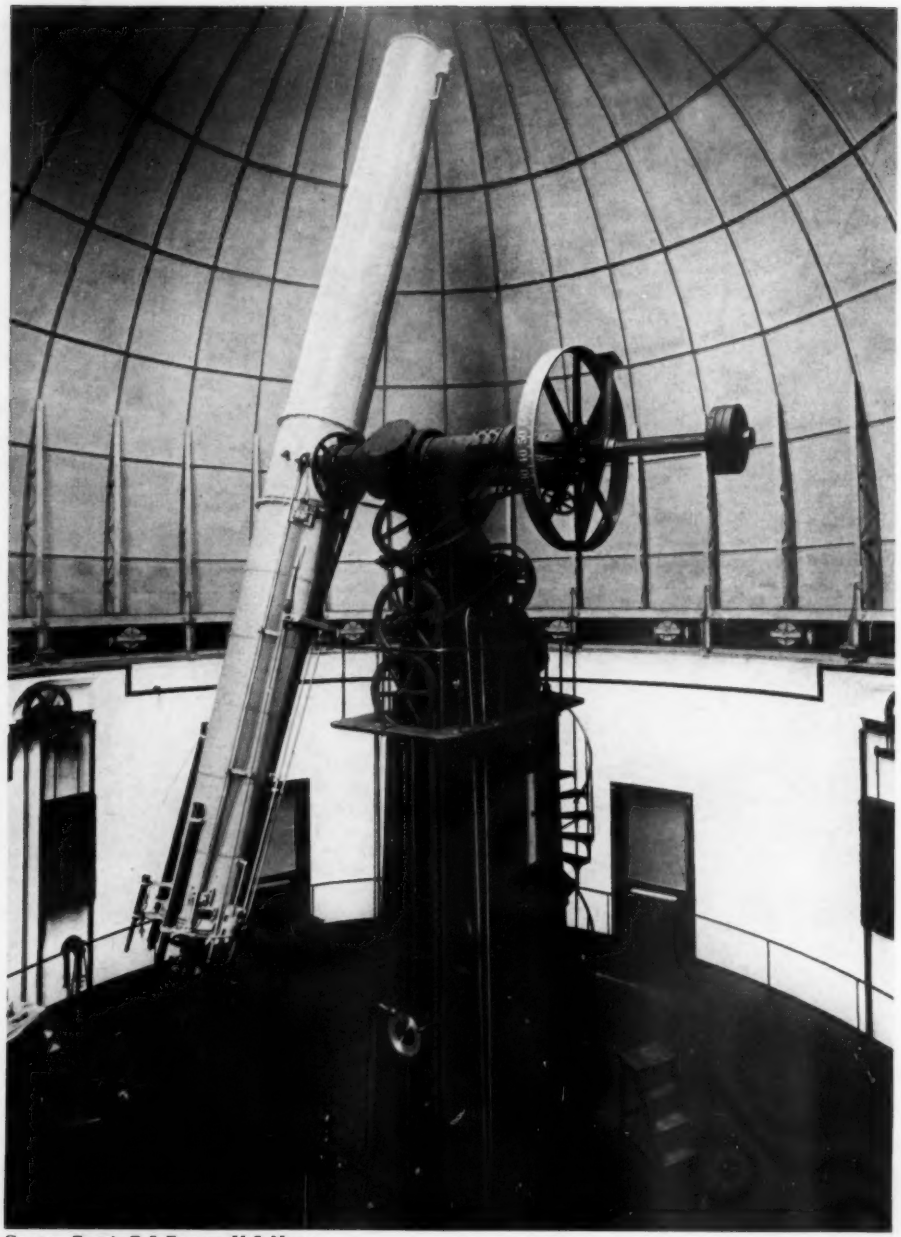
Sidereal Clocks.—In an underground vault beneath the clock house three sidereal Riefler clocks are securely mounted on piers sunk well into the ground. The vault is kept at a uniform temperature of 84° F. The clocks are encased in sealed glass cases from which the air is partially exhausted. The clocks are wound electrically. The tick from the clock in use as the standard is transmitted to the chronographs located for the convenience of the time service and of the observers at the instruments. The rates of the clocks are carefully determined. Sidereal time is sometimes called "star time" as distinguished from solar time, and indicates the hour angle of the vernal equinox.



Courtesy Captain C. S. Freeman, U. S. Navy

U.S. NAVAL OBSERVATORY FROM THE AIR

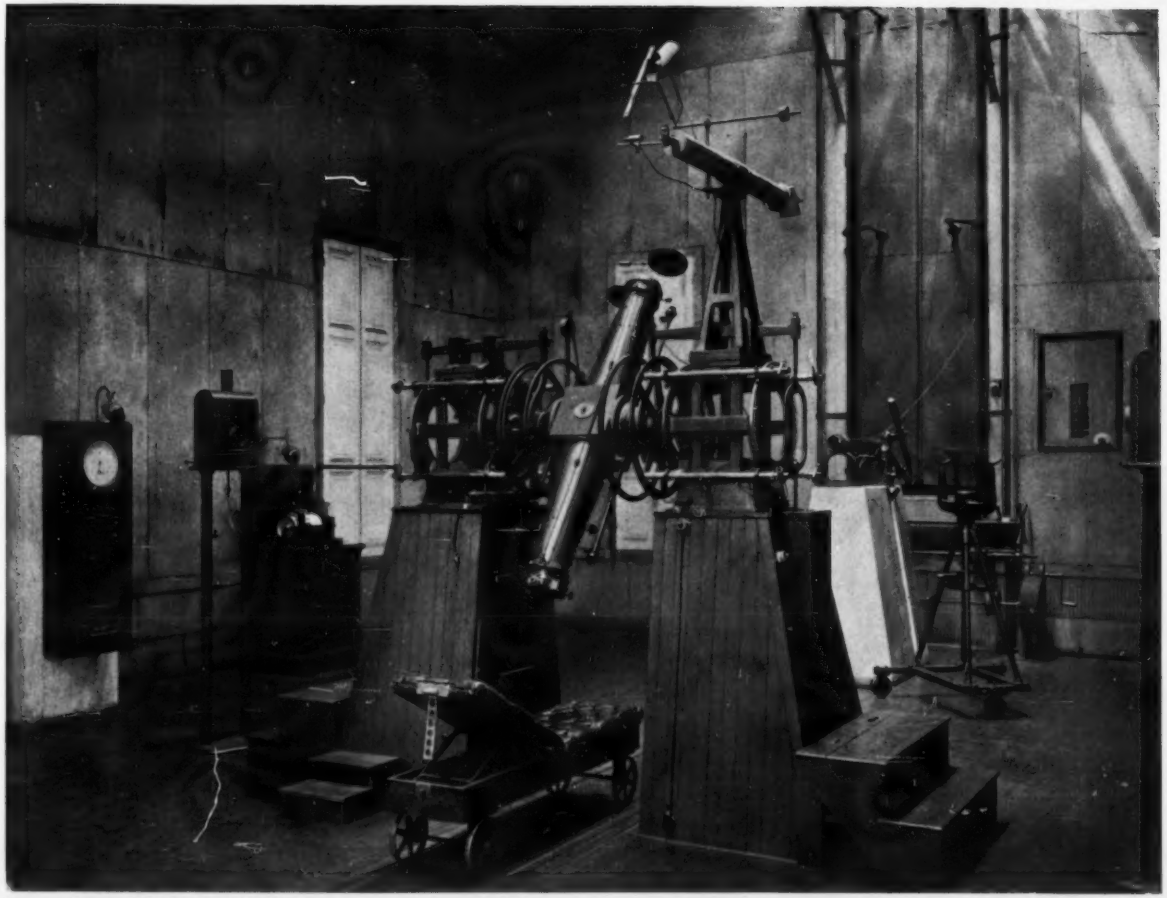
To the right of the main building are the shop and the quarters for astronomers. To the left the 26-inch dome is shown. Just beyond this the two gabled buildings inclose the 6-inch and 9-inch transit circles. Between these buildings is the clock house. Just north of the clock house is the Prime-Vertical house. Just beyond and to the left of the stand-pipe are the Alt-Azimuth and Zenith-Tube houses. Above the center the superintendent's residence stands. The white building near the bottom incloses the 10-inch photographic equatorial. Beyond the superintendent's residence, Massachusetts Avenue follows the arc of a 1000-foot circle, with its center at the clock house.



Courtesy Captain C. S. Freeman, U. S. Navy

THE 26-INCH EQUATORIAL, U.S. NAVAL OBSERVATORY

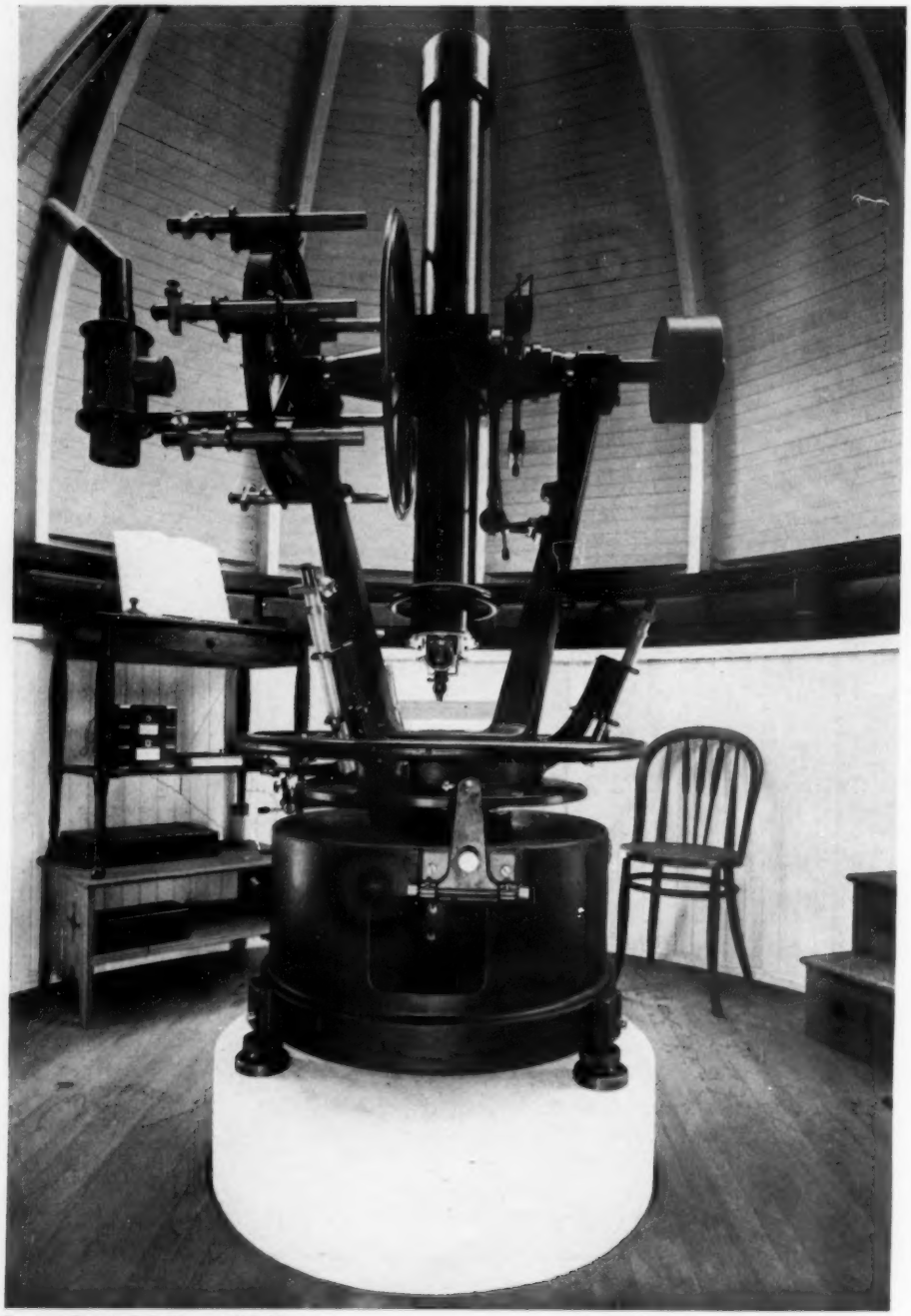
The mounting of this instrument was made by Warner and Swasey in 1893. The object glass, figured by Alvan Clark and Sons, Cambridgeport, Massachusetts, was the one used at the old observatory after 1873. For some time this was the largest instrument in the world. With it the satellites of Mars were discovered in 1877. The floor moves vertically for the convenience of the observer. The instrument is used to observe occultations of stars by the moon, to improve the lunar tables of the *Ephemeris*, and to observe the satellites of the planets, asteroids, and comets. Aperture, 26 inches; focal length, 390 inches.



Courtesy Captain C. S. Freeman, U. S. Navy

6-INCH TRANSIT CIRCLE, U.S. NAVAL OBSERVATORY

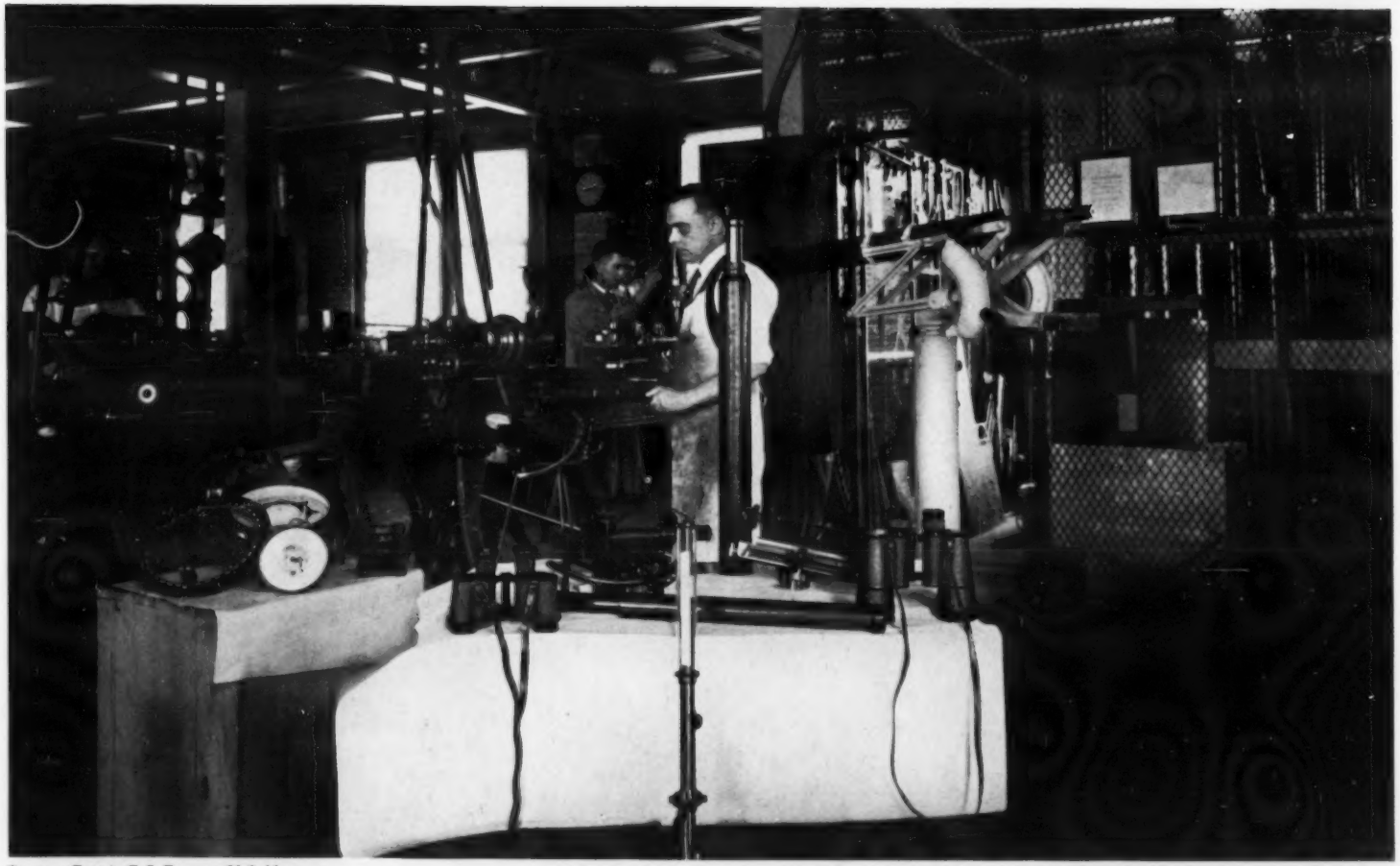
This instrument was made by Warner and Swasey in 1897, the optical parts being furnished by J. A. Brashear. It is mounted on brick piers sheathed with wood. It is used to determine the right ascensions and declinations of heavenly bodies. A hand-driven self-registering micrometer is provided for observation of the right-ascension during the passage of heavenly bodies across the meridian, and a zenith-distance micrometer, for observation of the declinations. It is in continuous use for observing the sun, moon, planets and the standard stars. It was for years the only instrument used at the observatory for time derivation. Aperture, 6 inches; focal length, 72 inches.



Courtesy Captain C. S. Freeman, U.S. Navy

ALT-AZIMUTH INSTRUMENT, U.S. NAVAL OBSERVATORY

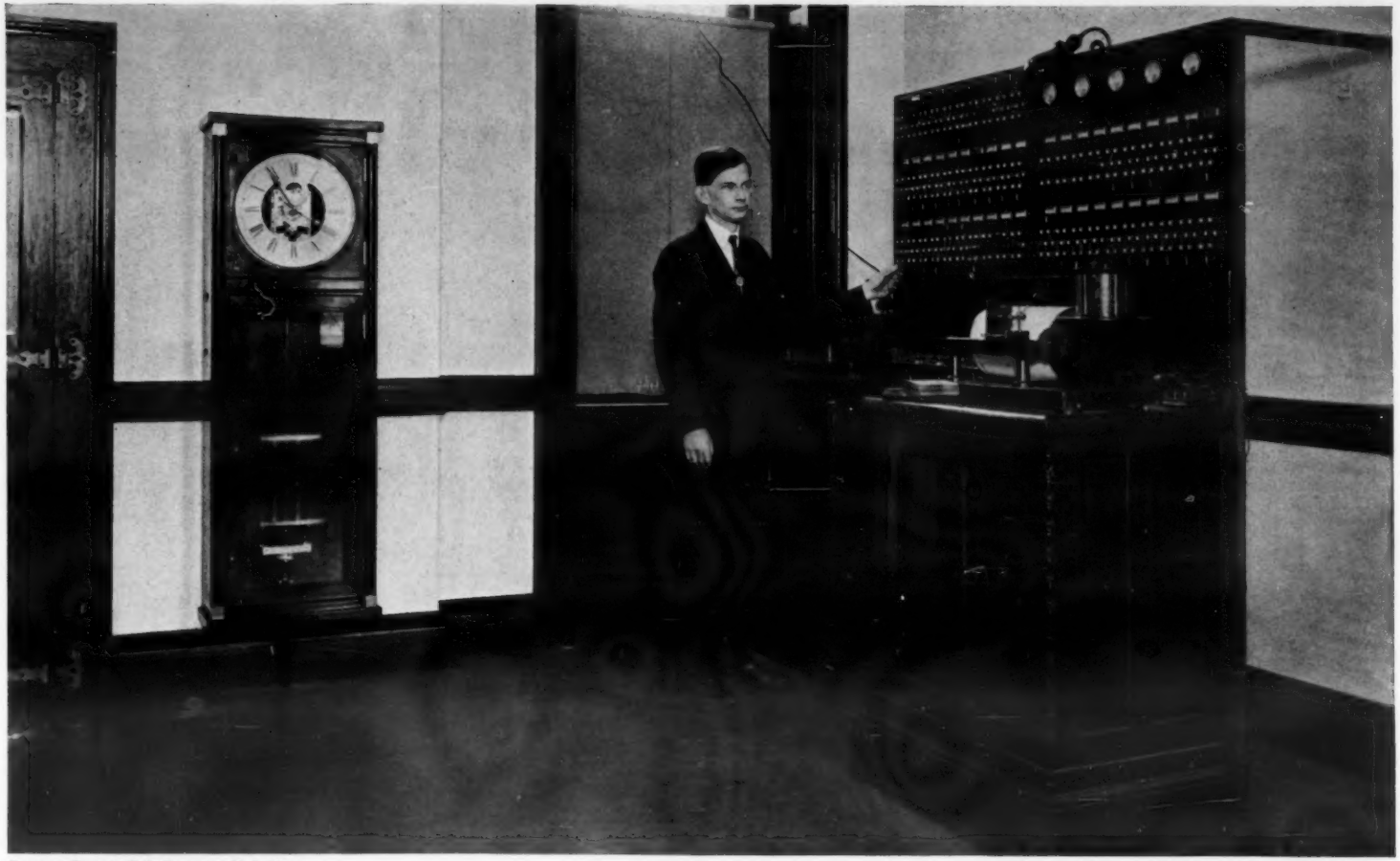
This instrument was made by Warner and Swasey in 1897. It is used as a vertical circle for determining the declinations of the heavenly bodies. Aperture, 5 inches; focal length, 50 inches.



Courtesy Captain C. S. Freeman, U. S. Navy

INSTRUMENT REPAIR SHOP, U.S. NAVAL OBSERVATORY

This shop is in continuous operation for repairing and testing of instruments of precision used by the Navy and by other government departments for surveying and navigation. Several thousand instruments are repaired annually. Among the instruments repaired are the accurate chronometers which are later tested in the time service of the observatory and sent to naval vessels and stations.



Courtesy Captain C. S. Freeman, U. S. Navy

TRANSMITTING CLOCK AND TIME SERVICE, U. S. NAVAL OBSERVATORY

The clock on the left transmits the correct standard mean solar time by means of an electric break circuit operated by the pendulum. Time is transmitted at 12:00 noon and at 10 P.M. (Eastern Standard Time) through land wires, and by radio control circuits to Arlington, Virginia; Annapolis, Maryland; Key West, Florida; and San Diego, California.

The switchboard shown carries connections to the various clocks, and to the radio sets, for recording the clock ticks and the radio signals on the chronograph, and for connecting the transmitting clocks to the broadcasting stations. Land wires for transmission of time for commercial purposes are also connected to this switchboard. The chronograph has a drum covered with paper on which is recorded outgoing and incoming time ticks for measuring the error in the time signal.

chronograph has a drum covered with paper on which is recorded outgoing and incoming time ticks for measuring the error in the time signal.

Courtesy Lieutenant Commander Richard Wainwright, U. S. Navy (Retired)

INTO THE MEDITERRANEAN

On January 7, 1909, the battleships left Suez and transited the canal.

Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired)

THE *CONNECTICUT* AT MESSINA

The earthquake at Messina on December 28, 1908, caused the *Connecticut* to rush to the scene of the disaster to learn what aid could be rendered. The flagship is seen at anchor with a division of British ships that also came to lend assistance.

with a division of British ships that also came to lend assistance.

Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired

A STREET VIEW IN MESSINA, SICILY, AFTER THE QUAKE

The U.S.S. *Illinois* was sent to the scene to recover the body of the United States consul, and to give all assistance within her power.

Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired)

RESCUING THE WOUNDED FROM THE RUINS OF MESSINA

The *Illinois* was at Messina some eighteen days after the quake, and even after so long a time, two persons were taken from the ruins alive.

Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired)

ANOTHER VIEW OF MESSINA

United States supply ships were sent to distribute provisions and clothing and, later, to erect temporary houses to shelter the refugees.

Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired)

REFUGEES AT MESSINA

Some 200,000 are supposed to have lost their lives in this disaster.

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Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired)

THE FORUM ROMANUM

As viewed by the officers and men of the U.S.S. *Connecticut*, 1909.

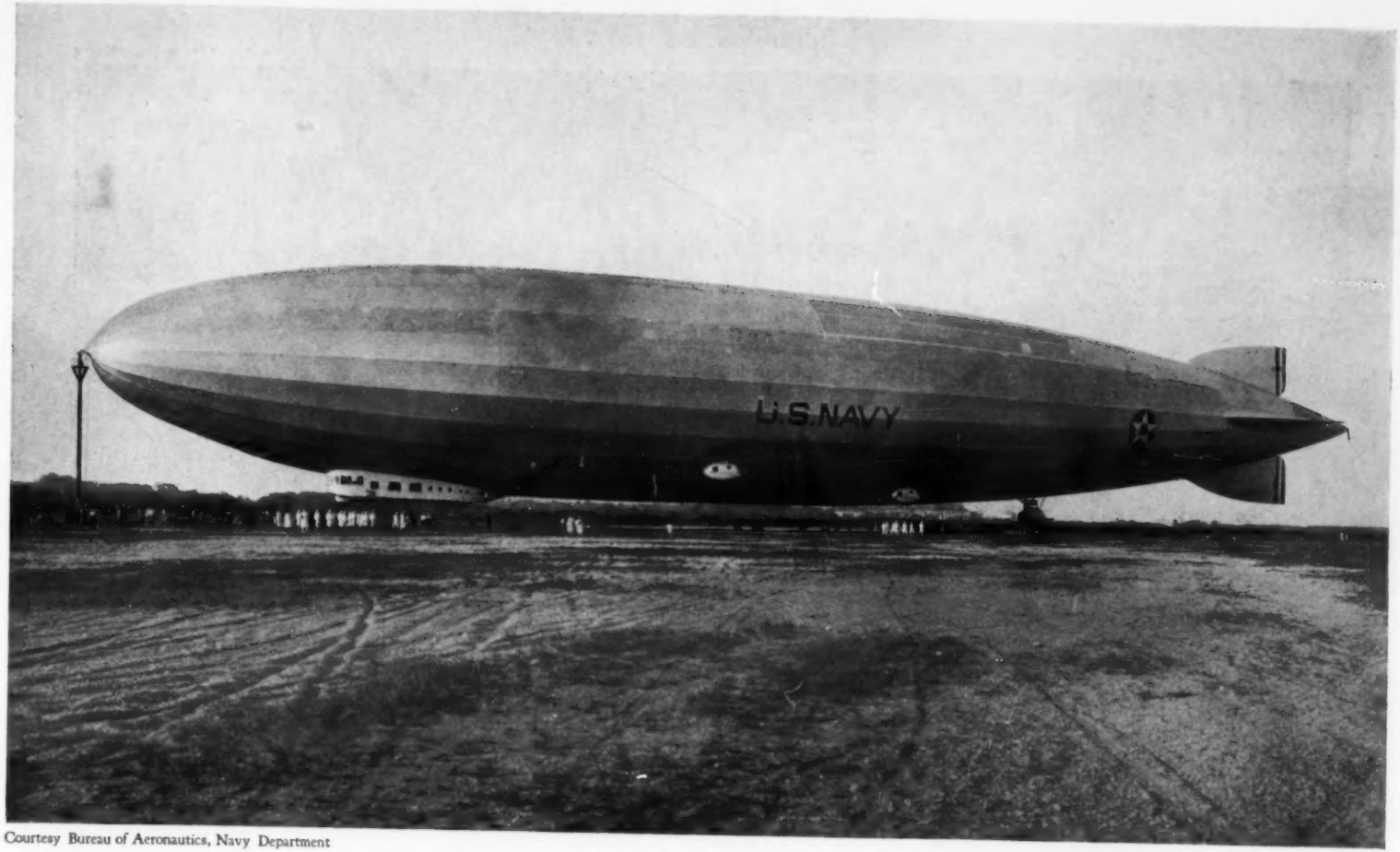
Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired)

ROMAN FORUM FROM CAPITOLINE HILL, 1909

ROMAN FORUM FROM CAPITOLINE HILL, 1909

International Newsreel

VIEW OF THE *GRAF ZEPPELIN*
As it flew over the Capitol, at Washington, October 10, 1928.



Courtesy Bureau of Aeronautics, Navy Department

THE *LOS ANGELES* AT FRANCE FIELD, C.Z., FEBRUARY 28, 1928

PVT Prime Takes *a* Hop

By LIEUTENANT COMMANDER H. V. WILEY, *U. S. Navy*

YOU perhaps remember that sometime in the dim past, at the Naval Academy or elsewhere, you made the acquaintance of *PVT* Prime. Except as a convenient formula for working some simple problems in physics, you gained no lasting acquaintance, and have forgotten *PVT'* unless you have been engaged in certain branches of engineering. However, anyone engaged in aërostation soon discovers that *PVT'* is piloting him at all times; unless he knows *PVT'* intimately, and all his relations, some unforeseen circumstances may develop which are later found to be the standard behavior of *PVT'* and should not have been in any way unexpected.

Some months ago it was suggested at Lakehurst that training flights of the U.S.S. *Los Angeles* should be extended somewhat. The short experimental and training flights were getting too commonplace, and more extensive experience would be gained from an occasional longer flight. It was decided to fly to Panama, which is U. S. territory, a suitable and safe distance, and which could provide an adequate Navy ground crew. As soon as this flight was suggested we began as usual in planning a flight, to consult *PVT'*. What were the pressures (barometric) to be expected at Panama and Lakehurst at the time of the flight? What volume of gas was required to carry the necessary fuel? What would be the change in this volume as pressure and temperature changed?

After making all calculations, and loading the ship accordingly, we decided to start during the early morning of February 26, 1928, expecting to take about thirty-six hours for a non-stop flight to Panama. We would use *PVT'* to help us get off with a heavy load, by taking the ship out of the warm hangar into the cold air. With a temperature several degrees higher than the surrounding air, called superheat, the gas would have greater volume and hence greater lift. Of course we would soon lose this false lift when the gas cooled, but by that time we would be in the air, and could maintain the extra load dynamically until some of the fuel had been consumed. But we went farther than this! In order to get a little more T in the gas, we started hot air blowers in the hangar, and soon had 3,000 pounds extra lift.

At 6:20 A.M., the big hangar doors rolled open, and the ground crew commenced walking the ship out. Stationed around the ship in groups, each group with a line to the ship, the ground crew functioned just as tugs do in warping a big liner out of a dock. The shore pilot called for more speedy movements. Why? *PVT'* told him that T would decrease quickly, particularly as an eleven- to twelve-mile wind was ventilating the ship; if we wanted to use the extra lift he must get the ship away quickly. Only one man of the crew for each station had embarked on the hangar. As the ship emerged into the colder air, she became so light that all the crew of forty-one were rushed aboard, and even then it was necessary to take more men temporarily from the ground crew as ballast until some of the false lift was lost.

Soon the extra handling lines were detached, and at 6:55 A.M. the order was given to "Up ship." The engines started immediately. As we climbed, *PVT'* again got to work, for we ascended rapidly into colder air. However, superheat began to decline sharply as soon as the flying level was reached and the air rushed by as speed was gained. As the air grew less dense with altitude the gas cells gained in volume; this made no change in lift as the weight of air displaced remained the same.

We reached lower New York Bay at 8:00 A.M. and set the course on a direct line for Colon, Canal Zone. The course led over New Jersey, leaving its coast at Atlantic City, bringing us just in sight of Cape Hatteras, and then over water again

until the Bahamas were reached. Several snow squalls were encountered, but as more southerly latitudes were reached the temperature rose. By sunset most of the crew had abandoned the heavy fur lined suits in which they had frozen at six degrees Fahrenheit at the start. It became possible in the early afternoon to operate the water recovery condensers, which would have frozen if started at less than twenty-three degrees Fahrenheit. There was as yet no need for the water recovery, as the ship was flying heavy, due to the false lift with which she had taken off.

The water recovery installation is an American invention which was originated in the development of the technique of helium operation of airships. Formerly, with hydrogen inflated airships, it became necessary to valve off some of the lifting medium as soon as the ship became light from the consumption of fuel, in order to maintain static equilibrium. The cost of helium made it mandatory to avoid this loss. This was done by designing a light air-cooled condenser suspended above the engine car, into which the engine exhaust gases are circulated, and the moisture content liquefied and returned to the ballast system. The efficiency of this system (from ninety to 115 per cent in practice) makes it unnecessary to valve out a large amount of lifting medium when two or three tons of fuel have been consumed, as an equal amount of water ballast has replaced it, and the load remains constant.

Shortly after leaving Cape Hatteras, heavy rain clouds were observed, and we knew we were over the Gulf Stream. From the air the water appeared steaming hot. Long feathers of vapor rose from it and traveled with the wind. Several steamers were sighted making very heavy weather, and we congratulated ourselves that we were being transported comfortably, rapidly and safely by more modern means. As soon as darkness fell the navigating officers began to drop flares upon the water to provide a point from which to determine the drift of the airship from the course.

At 10:40 P.M., an island of the Bahamas was sighted, but almost immediately a fog or cloud closed in and all sight of the surface was lost before any identification of the position could be made. We soon learned that whenever we were over shallow water, which was probably warmer than deep water, we were surrounded by low clouds. We asked the radio operator at Nassau for his conditions and he reported weather clear. By using our radio compass, we obtained his approximate bearing and soon sighted the lights of Nassau, only to have them disappear as another cloud intervened between us. In two or three minutes we were over the island; sure enough it was clear over land. After slowing the engines to look over the island, we continued on our line, and at dawn started across Cuba.

As the rising sun illuminated the surface of Media Luna Cay, we saw the U.S.S. *Patoka*, which had been diverted from carrying oil to the fleet, waiting to service us. There being no reason for stopping, we continued for Panama, having covered nearly two-thirds of the distance and having used only about two-fifths of our fuel. We expected to pick up the northeast trade winds as soon as we got offshore, which would add materially to our ground speed. However, before we got twenty-five miles offshore we encountered some ominous looking clouds which resembled violent thunderstorm clouds of our usual latitudes. Upon approaching them we found them to have no turbulence whatever, and except for causing us to fly low for visibility reasons, they afforded us no inconveniences.

At 10:00 A.M. we passed about three miles to seaward of the western point of Jamaica. We had not yet encountered the northeast trades! The wind was easterly and gave no help although it did not impede us. The clouds were magnificent in extent and most fantastic in shape. They extended from about 1,000 feet above the water to 4,000 or 5,000 feet. Since we had been in the air for thirty hours, time began to hang heavy on our hands, and we amused ourselves by pointing out figures of men, animals and other objects formed by the clouds. Officers off watch abandoned their bridge game to compete in pointing out the unusual formations. Every small island or shoal had its stationary cloud hanging over it. Later in the afternoon as the atmosphere began to cool, the clouds began to drop their water; often we would be within a hundred feet of a downpour and still be able to avoid it, although we did not try if more than a minor temporary change of course was necessary.

Colon reported a north wind and we watched our drift and ground speed closely to determine when we would be in it. As

we neared Panama, a sight was taken of a star in the Southern Cross to check our latitude and a radio compass bearing was utilized to determine if we were off our line. We had predicted earlier in the day that we would arrive about 10:00 P.M. At 9:15 P.M. we sighted the breakwater lights at the Atlantic end of the canal about twenty miles away, and soon we were over the Naval Air Station at Coco Solo, and France Field, where we were to land.

The engines were idled and the controls put in neutral in order to "weigh off" the ship. No change in inclination was noticed; the ship was in trim. Neither did the very sensitive instruments showing vertical movement indicate any marked rise or fall, hence it was determined that the ship was also in equilibrium, and ready for landing. *PVT'* did not have so much to do with this; his part was seen in the air density, which the humidity had reduced, so that the ship was relatively heavier in the humid atmosphere. Water recovery had been about ninety-five per cent efficient, the other five per cent loss of weight having been made up from change of lift from humidity and by the addition of moisture soaked up by the fabric of the outer cover and gas cells. If the water recovery apparatus had not been available, it would have been necessary to valve a considerable amount of lifting gas to compensate for the fuel burned. With helium at current prices the water recovery installation had more than paid for itself on this one flight, and also it had been demonstrated that this gear would be an economical adjunct for a hydrogen inflated ship. Of course the air cooled condensers retard the speed of the ship, but not in proportion to the economy in fuel or lifting gas afforded by their use. Undoubtedly commercial operation of even hydrogen inflated airships will demand water recovery apparatus, or a fuel gas of about the density of air.

An officer from Lakehurst had preceded the ship to Panama to supervise the landing and to erect an experimental stub mast to which the ship was to be moored during her stay. This mast was about sixty feet high and consisted of a wood spar topped by a "flower pot" or cup into which the mooring cone of the airship could be locked. With the mooring cone in this cup the forward car of the airship would be about ten feet from the ground, with a quickly detachable pneumatic wheel placed under the after car. This arrangement left the ship free to swing in azimuth to keep into the wind, while the heavy wheel aft kept the stern down if the ship became light. With the ship so close to the ground, vertical air currents were impossible, and gusts were much reduced below those encountered at the altitude of a high mast.

By the time the field had been circled twice a blinker message was received reporting the readiness of the ground crew, and at 10:20 P.M. the *Los Angeles* reached the ground. During the approach and landing it was noted that *PVT'* had influenced the altimeter, for it read 600 feet when we were on the ground, and the ground was only six feet above sea level. The barometric pressure had been much higher at the time of beginning the voyage, and the altimeter, an aneroid barometer calibrated in feet, requires the application of a correction whenever the surface barometric pressure differs from that at the time of take-off. Extra handling lines were attached and manned and the ship was "walked" over to the stub mast and secured. The water and fuel hoses were coupled and the ballasting and fueling begun. As fuel was obtained, the water which had been recovered on the flight was dropped. No supply of helium was necessary, as none had been valved, and the only servicing necessary was to exchange water for fuel. Newspapers were delivered in thirty-eight hours, the first New York newspapers received in the Zone less than five days old.

The routine of riding at the mast was very simple. An instrument in the control car told the officer of the watch the exact pressure or tension between the ship's bow and the mast. The pneumatic wheel under the after car could be observed for downward pressure at the stern. The ship was thus constantly weighed, and the officer of the deck adjusted ballast as necessary to take care of changes of lift or load, at all times keeping the airship slightly heavy.

After receipt of the weather map the next morning, it was decided to begin the return flight. The morning sun again heated the gas so that temporary extra lift was obtained, and also increased the volume of the gas cells so that the ceiling would not be very high unless helium were valved. Two extra passengers were embarked, making a total of forty-three on board. The officials of the Zone had requested that the

Los Angeles fly over the canal before departure. By 10:00 A.M. the flight crew was all aboard, the after wheel was detached, and at 10:12 A.M., the ship being weighed off slightly light, the commanding officer ordered the mast to "Let go." The ship commenced to rise steadily, but as an additional precaution an emergency ballast bag was emptied at the bow. The engines were cut in, and the flight began. We had left Lakehurst in a temperature of six degrees Fahrenheit and now had an air temperature of eighty-six degrees, with the gas somewhat above this, so that the gas cells were much fuller than at the start. But *PVT'* had told us just what to expect and everything turned out as calculated. The barometer also was lower and the gas expanded somewhat under the reduced pressure. We left the mast with rather less water ballast than is habitually carried. This was made possible by the installation of fuel dump tanks, which are regular fuel tanks with valves controlled by wires leading to the control car. This extra ballast is required only at the take-off provided that the trip is to be long enough for acquiring sufficient water ballast from the water recovery, to use in landing or in heavy rain, etc.

Since the air over the Zone was bound to be turbulent due to the uneven contour, the two oceans, water, and trees, it was desired to obtain a high altitude. At first a long turn was taken over water to give the gas time to cool and to decrease in volume. In a few minutes the ship was back over the breakwater, and transited the isthmus in forty minutes. After circling Balboa and Panama, and viewing the placid Pacific, we returned, and departed at 12:19 A.M. for the Gulf of Guacanayabo, Cuba.

As forecasted, head winds of about eighteen knots were encountered, but no effort was made to speed up, as the flying was comfortable and there was no necessity for high speed. Only four of the five engines were run, and these at economical speed. The low clouds were again present in unending procession, and in the fantastic shapes before observed. The flying altitude was from 800 to 1,100 feet to keep under the clouds and to avoid winds which were probably of higher velocity at higher altitudes. After a few hours, routine again began to pall. After dark, sextant altitudes of Polaris, which was nearly dead ahead, were taken hourly to check the latitude. The drift was relied upon as sufficiently accurate to keep upon the line laid down on the chart, but ground speed is not so easy to determine at night, unless time is taken to change and obtain the drift on another course, thence working out the ground speed, wind force and direction, etc.

At dawn, as expected, the outlines of Jamaica Island appeared a little on the starboard bow and at 10:58 A.M. the U.S.S. *Patoka* was sighted at her anchorage near Media Luna Cay. *PVT'* now began to work against us; the drier atmosphere and bright sunshine gave us extra lift which we did not desire if we wished to moor with the airship in equilibrium. Also as we slowed down for the approach for mooring, the lessened ventilation of the gas cells permitted them to absorb more heat. We could then wait until late afternoon to moor or we could valve a little helium. Our morning weather map was of such composition that there could be quite a variety of forecasts, with good reasons for each. However, it seemed practicable to us to moor at once, refuel, and take off again before sundown for Lakehurst. Hence the maneuvering valves were opened until we had lost about 1,500 pounds lift, and the mooring was completed at 1:00 P.M. Fueling was begun. *PVT'* immediately got busy and sent the gas temperature more than twenty degrees Fahrenheit above the air temperature. Soon the Weather Bureau forecast was received by radio, and its diagnosis differed somewhat from our own. Since conditions in the Gulf were perfect, and there was no hurry to return, it was decided to remain at the *Patoka* and perhaps make some local flights to Guantánamo or Havana. Our mission was training and we could obtain this as well by operating in the Caribbean as elsewhere.

The next morning, March 1, the weather map seemed to have borne out our prognostication and we decided to start for Lakehurst. In any flight of 1,400 miles or more it is always difficult to forecast accurately the conditions along the entire route, and it would be procrastinating to await until the whole line of flight would have perfect conditions. After superheat had given us extra lift, more fuel was taken aboard and at 10:40 A.M. the *Los Angeles* was unmoored. At this time the superheat was twenty-three degrees and as the gas cooled off the ship became very heavy. A direct route to

Miami would probably give less head winds at the start, but would cause the winds encountered north of Miami to be well forward of the beam. If we went further west at first, the westerly winds to be expected from Florida on to the north would be more abaft the beam and probably help instead of retard us. But due to heating of the air over land, the atmosphere was very turbulent over Cuba, and is was not desirable, although not dangerous, to carry a heavy ship through the one hundred miles or so of turbulent air. Therefore the course was set along the southern coast of Cuba. By the time Havana was reached enough fuel had been burned to put the ship near equilibrium.

Over Morro Castle we took departure for Tampa, and at once plunged into the clouds and mist of the Gulf Stream. Although we passed only a little more than thirty miles to the westward of Key West we were able to make out the light at that place. Tampa was not reached until 2:00 A.M.

After we left Tampa, ground fog began to form and soon the surface was totally obscured. Overhead, however, the stars were bright, and we knew that if the fog lasted for a long time, we could obtain our position from celestial observations. The fog gradually rose in height, and finally we had to fly at 2,500 feet to remain above it. The course led to the vicinity of Jacksonville. As the sun rose the fog dissipated and Jacksonville was in sight. We now intended to head for Lakehurst, but as Charleston, South Carolina, was only a few miles off the course, it was made the immediate destination and was passed over at 12:30 P.M. Up to this time the winds had been so far forward of the beam that we were not making much speed, but now they began to get more astern, and the ground speed gradually increased. At 7:45 P.M. we were over Norfolk, Virginia, and a little later we were logging as high as seventy knots over the ground, our engine speed never having varied from the economical four-engine speed. The reliability of these engines was remarkable. For six days none failed to respond, although some had run 800 hours without overhaul. At 11:35 P.M. we arrived over the home station at Lakehurst. We signaled our desire to moor to the mast, as the surface wind prevented our entering the hangar, and a fifty-two knot wind at 1,800 feet made it desirable to moor rather than use fuel to heave to over the station. However, we had from eighteen to thirty hours' fuel remaining so that there was no necessity for mooring.

While mooring the ship to the mast, a sudden veering of the gusty wind caused one of the mooring wires to break. We cast off to await better conditions and the assembly of the ground crew for a landing on the ground. The landing was made at 4:00 A.M. and the ship "walked" nearly to the lee of the hangar, when a sudden snow squall whipped out of the north. Old *PVT'* worked with a vengeance; the almost instantaneous temperature drop of ten degrees made the ship light. Gust of wind up to thirty-miles per hour caused the ground crew some difficulty in holding the ship, so that the word was passed to "Let go!" The engines started and the ship rose into the snow storm, disappearing at about two hundred feet altitude. Four men had not gotten the word to let go and were seen dangling from the car rail. They were quickly pulled into the car and shortly afterward a report was made to the station that the men were all safe. The ship heaved to over the coast about twenty miles from Lakehurst for about an hour, when a message was received from the station stating that the squall had passed, and that the ground crew was being assembled again. As we approached this time the landing field was seen to be covered with a blanket of snow over an inch deep. The landing was made without incident, and the ship was half way into the hangar before another squall hit which caused no inconvenience. *PVT'* was not through however, for as we entered the warm hangar, the relatively colder gas caused the ship to become very heavy, and it was necessary to valve some ballast to keep her from bearing down too heavy and slowing the movement into the hangar.

From start to finish, on the ground or in the air, for the whole six days and 5,500 miles, *PVT'* rode with the pilot.

Character *and* Success

By LIEUTENANT COMMANDER A. H. ROOKS, *U. S. Navy*

THE two most important things in a man's life are character and success. Moralists have always asserted that character is a good in itself, regardless of external achievement, that the attainment of a certain ideal of character constitutes success. This is a metaphysical assumption with which few of us would care to take issue. We have always been supremely interested in human excellence, and ready to honor it wherever found. But in the nature of things we are more apt to discover character when it is associated with success, and to value it when it contributes to success. Greatness of character and greatness of achievement are nearly synonymous in our thoughts, and our constant query is, how can we develop the one so as to attain the other? That is the meaning of life for most men; it is the object of all their vast and sweaty labors, of their Gargantuan strivings, of the dogged race they run against time and death.

Very few of us know exactly what success is. The philosophers have inquired into the matter very carefully without coming to any universally acceptable conclusions. Achievement, leadership, discovery, honor, wealth, glory, the attainment of some ideal of good—it is at best a matter of opinion. In the end each of us chooses his goal in the light of what he has learned from his experience and his environment, and measures his accomplishments against his imagination. Success, like culture, is thus a state of mind. I once met a convict who was immensely elated at being made a "trusty" and proudly asserted that he was a "self-made man." Yet it is one of the fortunate peculiarities of the human psyche that we are seldom long satisfied with our successes. Having achieved one goal, we immediately imagine a higher, more difficult one, and count ourselves failures until we have reached it. Tolstoi wrote two of the world's greatest novels, and then wished them destroyed, perferring to be known only for his philosophy. The world calls Tolstoi a great novelist and a poor philosopher. All of us may know something of that. One may build an enduring structure, or write an immortal verse, or win a famous victory, and yet count them of little worth compared to some imaginary goal which to others may be mere sound and fury, signifying nothing.

So we run the risk of doing a great injustice when we attempt to say that this man's life was successful, and that one's a failure. We can never be positive about that. All we can do is appraise a man's public acts and render our fallible judgments about them. We may never know what private goals his heart is set on, what personal difficulties he has had to overcome, or how well he has used the material at his disposal.

Any attempt at an analysis of character must take account of the above factors. Character is not spoken of here as a moral quality; it is that combination of qualities which distinguishes one person from another; it is the individuality which is the product of nature, habits, and environment. What is that combination of qualities which might be called essential to success? I think it is possible to describe it broadly as a fitting correlation between intelligence, knowledge, energy, emotional responses, and physical stamina, and to attempt to ascertain the relation of each of these to the whole and particularly to successful military character, not wholly by an academic discussion but by an appeal to such facts as are available.

There is a wealth of evidence in the biographies of the great and the near great to support the thesis that successful character is based in part on the gradual development of a profound knowledge in conjunction with what can only be described as creative intelligence. The genius first builds

a structure patterned on that of other men, absorbing their knowledge and their accumulated experience. In time he reaches the point where he can add something new to the structure. He becomes a creator, but only in the sense that he is developing or adding to what went before. The more he knows about the field in which he is laboring, the more personal or vicarious experience he has accumulated, the greater the play of his intelligence in moulding new patterns. Knowledge and intelligence are brothers who lean heavily on each other. Indeed, they can be compared to identical twins, sprung from the same egg, whom it is sometimes nearly impossible to tell apart. Was it knowledge or was it intelligence that made Napoleon the great commander? Doubtless it was both, but it requires a keen analysis to distinguish them. A psychologist has even described intelligence as a high degree of confluent experience.

But it does appear possible to differentiate between knowledge and intelligence. Knowledge alone will not suffice. There must be a high degree of receptivity to knowledge, and an ability to organize it, and it is this which we commonly think of when we speak of intelligence. There are many who would say immediately that it plays the leading rôle in our lives, because the acquisition and use of knowledge depends upon it. Is this true? Can we assign it the highest, or any order of precedence, in a hierarchy of essentials? Possibly not, but we would like to know something more of its relation to the whole that determines our success or failure.

When we begin to talk about intelligence, we set foot upon very controversial ground, for there are two schools of thought regarding the abilities of men. One holds that all men are born with approximately the same equipment, and that they differ in later life because of different environment and education. This was in part the attitude of the writers of our Declaration of Independence. It is also the attitude of the very modern school of behaviorists. The other holds that men do differ in their native endowments, that special abilities run in families, classes, and races, and that geniuses are born with talents superior to the common run. They admit, of course, that environment and training have their effect, but assert that inheritance is the predominating influence.

This matter is still an unsettled one. The work of Professor Pavlov and the behaviorists has done much to dispel the idea that inheritance is the preponderant factor. On the contrary, there is much experimental evidence in animal psychology and in the field of the conditioned reflex to demonstrate the great importance of training and environment. But to assert that they are all-important does too much violence to the facts as we have observed them in our daily lives. It is an attractive theory, but it seems more reasonable to maintain that there are differences in the quality of the inherited material, and that what then becomes of this material depends on the way it is "slanted" or conditioned by training and environment. The two points of view are largely theoretical in that there is very little positive evidence to support either. The truth is not to be learned by theorizing or philosophizing, but only by the gradual accumulation of facts based on sound observation. The subject is an important one, since a man's belief concerning it determines in a great measure his whole outlook on life, and any facts tending to decide it one way or the other will have a far-reaching effect.

What, then, can we say regarding intelligence? Are there differences in native intelligence, and if so, what do they predict as to ultimate success in a chosen work in life? The controversy surrounding this question has been intensified by the so-called "intelligence" tests, with which nearly everyone now has some familiarity. Thousands of school and college students have submitted to them, and they were given to practically our entire army during the World War. Naturally these tests have aroused a great deal of opposition. They are designed to measure hereditary differences, not differences in education. It is precisely this, say their critics, which they do not and cannot do; in the average, the better educated individual will do better in the tests. Moreover, psychologists have never agreed on just what intelligence is. Some consider it a behavior unit. Others contend that it has many aspects, as mental or nervous energy, perseverance, quickness, retentivity, self-control, etc., and that the tests so far in use do not take all these into

consideration. They may measure one aspect of intelligence, but no one knows that for certain.

Whatever may be said against the tests, it does appear that they furnish a fairly reliable index of the relative ability of groups of school and college students to learn. There is a relation between success in "intelligence" tests and scholastic success.

For the past six or seven years officials at the Naval Academy have been conducting "intelligence" tests to determine, among other things, whether there is a relationship between the mental classifications resulting from the tests and relative standings for the four-year course. In an article in the UNITED STATES NAVAL INSTITUTE PROCEEDINGS for February, 1925, entitled, "Intelligence Tests at the Naval Academy," Lieutenant Commander M. S. Tisdale, U. S. Navy, presented evidence in support of the conclusion that those groups making the highest marks in the psychometric tests also made the highest academic marks, and graduated at the top of the class.

"The psychological measure of an *individual,*" he concludes, "cannot be taken as a final index to his future, but the measure of a group can be taken accurately and the success or failure of the *average* of the group predicted with certainty."

Later tests tend to substantiate this conclusion as applied to academic work. An illustration of the general results obtained is shown in tabular form. The test used, as described by its author, is designed to measure "mental ability" and "brightness." The first is an innate mental quality which increases with age; the second refers to that constant quality which determines the rate of growth of the mental ability of an individual and the degree of mental ability which he will eventually reach. The two left hand columns of Table I show the groups into which an entering class was divided as a result of the tests, and the number in each group. The remaining columns show the results at the end of one year. For the benefit of readers unacquainted with the Naval Academy, it should be explained that a "star" student is one with a distinguished academic record. It will be noted that, as was to be expected, the "superior" and "good" groups gave much the best account of themselves, and that by far the largest percentage of failures came from the "passing" and "poor" groups.

TABLE I

RESULTS OF OTIS SELF-ADMINISTERING PSYCHOLOGICAL TEST

U. S. Naval Academy, 1926-27

Group	No. in Group	Total Deficient	Per Cent Deficient	"Stars"	Per Cent "Stars"
Superior	23	0	0	5	21.7
Good	65	1	1.54	14	21.5
Average	287	26	9.06	18	6.3
Passing	37	7	18.92	0	0.0
Poor	27	10	37.00	0	0.0
Totals	439	44	10.02	37	8.4

We do not need such a table to tell us that men vary in their ability to learn; we know that from experience. It may be objected that it is due to several factors: ill health, lack of energy, and lack of interest, as well as differences in intelligence. But these should affect all the groups equally. Moreover, physical deficiency is a bar to entrance; considerable energy must be presupposed in one who has been able to master the difficult entrance examinations; and interest is powerfully stimulated by the competitive system. The curriculum requires the ability to learn rapidly. If we define intelligence as the ability to perceive quickly the true relations between things, we have here a fairly reliable indication that there are differences in intelligence, that they can be measured in groups, and that reliable predictions can be made for the groups. At least it can be asserted that at an average age of nineteen years a large number of youths, competing in exactly the same external environment, behave as if there were such differences. That may be said to be all we are interested in as practical men concerned with the present generation. I believe it to be the contention of the behaviorists that if each of the members of the class examined above had been subjected to exactly the same environment and training from infancy on, then no marked differences in intelligence would have been discovered, and their scholastic performances would have been about equal. It is surely to be hoped that the behaviorists prove their point and discover the means of bringing about such a desirable result.

At the end of four years of competitive academic work both of a theoretical and of a practical nature, during which time they are subjected to a rigid, fair, and

painstaking system of marking, the graduates are commissioned in the service in the order of their scholastic merit, and are promoted through the junior grades in that same order. Eventually they become due for promotion to the senior grades, but must now face the rigid scrutiny of a selection board which is of necessity obliged to choose a few among many, particularly in the highest grade, that of rear admiral. Officers are selected for this grade on the basis of their official records, and presumably because the selection board considers them to be the best of those available. Without arguing the merits or faults of selection, the result of the board's deliberations may be taken as one criterion of professional success under present conditions.

What results can we expect now? At this critical moment in a man's life will the classification of years ago still hold good? Is it to be expected that under similar conditions the man who once demonstrated greater ability and stood near the top of his class will achieve a greater success than one lower down? The naval profession is one of the few where this inquiry can be pursued with any profit. In other walks of life the lack of data, and differences in fortune, family, and environment, render it difficult. In the Navy complete records are available; the officers come almost wholly from the same source; they are working in the same general environment; and finally there is the adequate criterion of professional success.

Table II shows the standing at graduation from the Naval Academy, in a composite class of 100, of those officers who have been selected to the permanent grade of rear admiral in the line of the Navy since the inauguration of promotion by selection in 1916. Temporary and "shore duty only" selections were omitted from the compilation. Also, for a number of years after 1883 only enough officers were commissioned in the line of the Navy to fill existing vacancies, commissions being awarded according to class standing, resulting in the honorable discharge of large numbers of midshipmen from the lower halves of certain of the classes. To include these classes in the general table would distort the picture considerably. They are therefore omitted from Table II, but are listed in the supplementary Table III. In all classes the graduates are listed in the order in which they entered the line, those who later entered the construction corps being omitted.

A study of these tables will show their relation to the psychometric table, and will answer, in part, our question concerning the relation of intelligence to ultimate success. The psychometric table (Table I) indicates that the average of the higher groups in psychometric examinations will stand higher in academic work, and leads to the inference that they have greater natural ability. Table II, concerned with practically all of the graduates of certain classes, shows nearly twice as many selections from the first half of the respective classes as from the last half. The *average* of the group demonstrating the higher ability in academic work was much more successful in a life's work than was the lower. The evidence pre-

TABLE II

The numbers in the table represent the class standings at graduation of officers selected to the grade of rear admiral in the line of the Navy since 1916. (Each class was assumed to have 100 members; the numbers are therefore proportional. The twenty-fifth man in a class of fifty would show as 50 below.) Certain classes in which a majority of the graduates were honorably discharged are omitted from this table, and are listed in Table III.

First Quarter	*Second Quarter*	*Third Quarter*	*Fourth Quarter*
1–1		51	
	27		77
	28		
5		55	
	31–31	56	81
	32		
8	33		83–83
9–9–9	34–34	59–59	
10–10	35		
	36–36		
			87
13	38	63	88
14–14	39		
15	40	65	
16	41		91
17	42		
18	43	68	
		69	
20	45	70	95
			96
22		72	
23			
24			
	50–50–50		100–100
Totals			
20 or 31.7%	21 or 33.3%	11 or 17.5%	11 or 17.5%
65%		35%	

sented in these two tables is mutually corroborative.*

It is interesting to note that in Table III a quite different distribution is apparent. This was to be expected, since all the individuals who were originally commissioned were drawn from the upper part of their classes. Among such individuals, the chances of success will be about equal, as the table plainly indicates.

TABLE III

This table is similar to Table II, but deals with certain classes in which a majority of the graduates were honorably discharged in accordance with the existing laws.

First Quarter	*Second Quarter*	*Third Quarter*	*Fourth Quarter*
1			
			79
8	33	58	
12	37	62	87–87
13			88
			91
	42	67	
		70	
21			
23			
	50	75	100
Totals—			
6 or 28.6%	4 or 19%	5 or 23.8%	6 or 28.6%
48%		52%	

No account has been taken of external influences, such as death, ill health, misfortune, preference for another profession, etc., since these influences affected the average of the groups equally. At about eighteen years of age a fairly large number of boys started out to achieve among other things a certain criterion of success. At about fifty years of age some of them arrived. Thus it is, not only in the naval profession, but also in all others.

But there is yet another fact in this connection which vitally alters the significance of any general conclusions to be drawn from what has gone before, and which points directly to the other fundamentals of character. The Navy Department chooses from among the rear admirals of the active list certain officers to fill the highest commands at sea and on shore, such as commanders-in-chief of fleets, and so on. It has been determined that in the majority of cases during and since the World War, the officers chosen for these posts have come from the lower halves of their classes, and in some instances from the bottom. Our classification of ability affects only groups, not individuals. The slower, less brilliant student is sometimes the most successful of all. In the effort to overcome whatever original handicaps he has, he frequently develops unusual powers. The "anchor" man in the class may become another Nelson or Farragut.

To explain this it is necessary to return to a consideration of character as a whole. For the great character, and particularly the great military leader, something more than the quickest intelligence is required. In the end there must be a balanced personality, with intelligence and knowledge controlled by other factors.

The first of these is undoubtedly energy. It is my experience that the leading commanders of our military services have been almost invariably men of outstanding mental vigor. They have, so to speak, radiated vital energy. Ludwig, in his biography of Napoleon, portrays a man of truly astounding energy. There is a distinction between simple bodily health and nervous energy; the one does not necessarily mean the other. Throughout the lives of all the great men of history this is to be observed. They frequently had defective bodies and ill health, but nevertheless there burned within them a great fire relentlessly driving them to achievement.

An instance of what is meant here was the achievement of Colonel Baird-Smith, who maintained unimpaired vigor throughout the siege of Delhi, in spite of suffering from scurvy, a gangrened foot, a sprained arm, and constant diarrhea, leading James to the conclusion that our organism has stored reserves of energy not ordinarily called upon, deeper layers of combustible

*Since the above was written, an article in *Harper's Magazine* for May, 1928, entitled, "Does Business Want Scholars?" by Walter S. Gifford, president of the American Telephone and Telegraph Company, gives the results of a similar investigation among the personnel of the Bell System. "In general," he says, "the normal expectation is that any college graduate entering business has one chance in three of standing in salary among the highest third of all the college graduates in his company. From this study . . . . it appears that the man in the first third in scholarship at college, five years or more after graduation, has not merely one chance in three, but about one in two of standing in the first third in salary. On the other hand, the man in the lowest third in scholarship has, instead of one chance in three, only about one in five of standing in the highest third in salary. There is also nearly one chance in two that he will stand in the lowest third in salary." (Quoted by permission.)

material ready for use if we probe deeply enough.

The second is concerned more particularly with the emotions, with how a man feels toward his profession. Everyone is a metaphysician in that he ultimately acquires some idea, right or wrong, as to the meaning of the universe and of his part in it. Here, I believe, is the keystone of the arch of character, military or otherwise. To change the figure, a man's idea of ultimate good is like the engineer at the throttle releasing vital energy to the machine which is his body and brain. A man may have conflicting ideas; the machine will not run at full power, and his life will exhibit indecision, inconsistency, and failure. Or a man's ideal may be of the most narrow self-glorification. Coupled with great energy and intelligence, this may lead to a certain kind of success. But those whom the world unites in calling great have been men who identified themselves with creative work of universal significance. The highest type of man likes to feel that he is contributing in some measure toward the accomplishment of such a work. If a man can feel that his work is of that nature, it becomes the absorbing passion of his life. His emotional responses will be adequate. His ambition, his energy, and his enthusiasm will have full play. The machine will run at full power, and its accomplishments should be great. If he cannot have that feeling, it would be better to change his profession while there is still time; he cannot hope for the greatest satisfaction or success in life. I believe that the men who have made the greatest success in the naval profession have had the greatest reasoned belief in the creative significance of their mission in advancing the security and welfare of their country, and in preserving the peace of the world. That, of course, is only one among many possible creative activities open to a man. Whatever it is that he chooses to do, a man will put a greater power to work if he can think of it in that light.

The third great contributing factor in success is, of course, physical stamina. The most brilliant student is not necessarily the one best fitted to withstand the nervous and physical strain inseparable from arduous service in the battle fleets, and particularly that associated with the great responsibilities of the highest commands. Nerve and muscle strain take their toll in all groups.

Success, then, must depend upon a fitting correlation between these five attributes: intelligence, defined as the ability to perceive quickly the true relations between things; a comprehensive knowledge, an exceptional familiarity with the field covered by the endeavor; an abundant supply of nervous energy; adequate emotional responses to the work in hand; and sufficient physical stamina to enable the work to be carried on. Writers on military character are practically unanimous in their choice of the traits which distinguish the great leader. Loyalty, decision, courage, patriotism, poise, tact, imagination, initiative, steadfastness of purpose, ambition, a sense of justice, self-sacrifice—what are these but terms descriptive of behavior flowing from such a correlation? In genius we will find that correlation to approach perfection. Of these there is some evidence that a quick intelligence is a native endowment which varies with the individual. Intelligence is closely connected with the store of nervous energy. There is no evidence as to whether or not the latter varies among individuals because of differences in native endowment, but it is certain that the release of energy is largely controlled by emotional responses. It is certain, too, that knowledge, adequate emotional responses, and physical stamina, barring accident or disease, can be built in, or learned by training and discipline. Even the handicap of a slower intelligence can be largely overcome, if the individual's attitude is favorable. It appears, therefore, that genius must be both born and made. But it also appears that those less favored of the gods can still achieve the highest success, if they can think of their task as worthy of a life's devotion. It may not be in mortals to command success, but such as they will deserve it.

Ships That Pass

British and German Battle Cruisers Maneuver at Close Range on the Eve of Hostilities

By COMMANDER C. C. GILL, *U. S. Navy*

IN THE forenoon of August 4, 1914, two British battle cruisers, *Indomitable* and *Indefatigable,* at a speed of twenty-two knots on a westerly course, were searching the waters of the Mediterranean for the German battle cruiser *Goeben* and her consort, the light cruiser *Breslau.* France and Germany were at war but England was still hesitating. Early that morning the German cruisers had fired the opening shots of the naval war by bombarding French shipping and shore establishments at Bona and Philippeville on the North African coast. The *Goeben* and *Breslau* were now withdrawing on easterly courses toward Messina, and by coincidence were heading almost directly for the approaching British battle cruisers. Visibility was excellent across a tranquil sea under a pleasant sky. The stage was set for a dramatic encounter. The attending circumstances were such as to cause naval officers to ponder.

The two British battle cruisers were under command of Captain Kennedy in the *Indomitable.* They were part of the English Mediterranean fleet of three battle cruisers, four armored cruisers, four light cruisers, and sixteen destroyers based on Malta. The instructions under which Captain Kennedy was operating were in brief: to shadow the German cruisers wherever they went; to prevent their escape via Gibraltar; to cover French troop transportation from Africa; to protect trade in the east basin of the Mediterranean; and to be ready to act upon the opening of hostilities between England and Germany, which was imminent.

There was also to be considered the following telegram sent from London on August 2:

Admiralty
To Commanders-in-Chief, all stations.

Today, August 2, at 2:20 the following note was handed to the French and German Ambassadors. (Begins) The British Government would not allow the passage of German ships through the English Channel or the North Sea in order to attack the coasts or shipping of France. (Ends) Be prepared to meet surprise attacks.

On the German side, Vice Admiral Souchon, flying his flag in the *Goeben,* had received secret instructions to proceed at all possible speed to Constantinople. The *Goeben* was short of coal, however, and the German cruisers were en route to Messina to refuel before making a break for the Dardanelles.

At this particular time Admiral Souchon was in a tight corner. A potential enemy, the British fleet, was to the eastward, and an active enemy, the entire French fleet, was to the westward. Caught between the two he was cut off from German and Austrian bases, and had only neutral ports in which to seek refuge in the comparatively narrow waters of the Mediterranean. But the so-called "*Goeben* luck" had already begun to operate in his favor.

In early morning of this day, when Admiral Souchon announced his whereabouts by the bombardments of Bona and Philippeville, the French fleet, also in search of the two German cruisers, was conducting a sweep to the south in three groups. The east group was heading for Phillippeville, the center group for Algiers, and the west group for Oran. At 6:30 the French commander-in-chief, Vice Admiral Lapeyrère, had signaled to Vice Admiral Chochepret, commanding the eastern group of six battleships, three armored cruisers, and twelve destroyers: "Bona attacked this morning by German cruisers. Maneuver so as to make contact as quickly as possible and to combat them."

Admiral Chochepret at once changed

course for Bona and increased speed. At 8:00 A.M. this eastern group was so situated, forty-two miles to the northwest of the *Goeben*, that, had course and speed been maintained, the two enemies would have met at 10:00 A.M. Also Captain Kennedy with the two British cruisers then would have been only twenty miles to the east and approaching at a speed of twenty-two knots.

In this critical situation Admiral Lapeyrère made an important change of plan. One hour and fifteen minutes after he had sent the message to the commander of the east group to make contact with and combat the German cruisers, he received a radio in plain language saying that the German cruiser that had attacked Philippeville was continuing west at full speed. Although it was suspected that this message might be of enemy origin it apparently influenced the French commander-in-chief to modify the previous instructions to Vice Admiral Chochepret by the following order, sent at 7:30 A.M.: "Make course for Algiers as rapidly as condition of *Mirabeau* will permit."

Of this sudden change of plan, Admiral Lapeyrère has said: "I gave order to the eastern group to change from course for Philippeville and to head for Algiers at all possible speed in order to bar the passage of the enemy to the open sea."

Twenty minutes later, at about 8:00 A.M., Vice Admiral Chochepret received this order to proceed to Algiers, and the entire east group executed the required ninety degree change of course. The three cruisers now advanced and deployed ahead, while the battleships and destroyers continued in close formation. As the distance between ships in the cruiser line was extended only 3,200 yards, the track of the inshore ship on the extended flank was about four miles south of the track of the battleships. At 9:15 A.M., the *Goeben* passed approximately twenty miles from this cruiser. Visibility was about fifteen miles, so, within the limits of navigational errors the margin of escape from a sight contact was about five miles.

It was an extraordinary piece of luck for Admiral Souchon that this abrupt change in the French plan was made just in time to prevent a contact between the *Goeben* and the east group under Vice Admiral Chochepret. It was also a stroke of good fortune for the German side that the French formation was comparatively compact. Had the French cruisers and destroyers been sent out ahead to do a little scouting they could hardly have failed to find the enemy. It is true that the slower French capital ships might not have been able to bring the faster *Goeben* to immediate action, but the destroyers had superior speed and could not have been shaken off. They would have had favorable opportunity later on to make night torpedo attacks. Even had the German cruisers succeeded in reaching Messina, definite knowledge of their whereabouts, combined with the presence of French destroyers and cruisers in the vicinity of the west entrance, would have rendered Admiral Souchon's subsequent break for the Dardanelles an almost hopeless venture.

Notwithstanding these factors of a modified French plan and inadequate French search operations, the *Goeben* and *Breslau* were not yet out of difficulty. They had evaded one enemy only to become involved with another. While these maneuvers were being made in the west, the British battle cruisers *Indomitable* and *Indefatigable* were approaching at high speed from the east. Captain Kennedy had wisely laid a course well offshore, and at 10:35 A.M., the *Goeben* was sighted almost directly ahead. Admiral Souchon made a turn to port, and Captain Kennedy promptly replied with an alteration to starboard in order to close. The *Goeben* then turned back to starboard and the ships passed each other on opposite courses at a distance of about 8,000 yards. England had not yet entered the war, but the break was imminent and the prospective enemies watched each other's movements closely. The guns on both sides were loaded and the crews were at battle stations, but the turrets remained in the position of secure, trained fore and aft. The usual salutes of courtesy were not exchanged.

Vice Admiral Souchon at first thought that Admiral Milne was on board one of the battle cruisers. In that case, as the English admiral was senior, the *Goeben* should have fired the first salute. The German narrative written by Ludwig says that Admiral Souchon contemplated sending a signal to explain that no salute was being fired because the guns were all loaded. In the end he decided not to do this. It may be that as the ships approached each other, it was noted that neither of the British vessels was flying an admiral's flag. As a matter of fact, the German commander was

the senior and, if courtesies were to be exchanged, it was for Captain Kennedy to fire the first salute. The ships passed in silence. Then the two British battle cruisers countermarched in a wide circle and proceeded to shadow with the *Indomitable* on the *Goeben's* starboard quarter, and the *Indefatigable* on her port quarter.

This was the second dramatic encounter at sea that had taken place between warships soon to become enemies in the World War. A few days earlier the French dreadnoughts *France* and *Jean Bart* were returning from Russia with the president of the republic, several ministers and other officials on board, when, on July 31, the German High Sea Fleet was met in the North Sea. At this time it was known that there was no hope of avoiding war. Germany had it within her power to destroy at one blow the governmental leaders of her future enemy together with their two newest and most valuable warships. For the French, the situation was the more embarrassing because the guns of the new dreadnought *France* were without breech blocks and without ammunition. After an anxious interval the German flagship saluted the standard of the French president with twenty-one guns, and the salute was immediately returned gun for gun.

In the Mediterranean meeting, Admiral Souchon probably had a more narrow escape than he realized at the time. Captain Kennedy at once reported that he was shadowing the *Goeben*, and the information was forwarded to London. Upon receiving it, the first lord of the Admiralty submitted the following memorandum:

(Most Urgent)

Prime Minister Sir Edward Grey.

German battle cruiser *Goeben* and fast light cruiser *Breslau* have been found west of Sicily and are being shadowed by British battle cruisers *Indomitable* and *Indefatigable*. It would be a great misfortune to lose these vessels as is possible in the dark hours. She is evidently going to interfere with the French transports which are crossing today. The following telegram has already been sent: "Good. Hold her. War imminent." We wish to add to this: "If *Goeben* attacks French transports, you should at once engage her." An immediate decision is required.

W.S.C."

The prime minister, Sir Edward Grey, agreed to Mr. Churchill's suggestion and the Admiralty at once sent to Captain Kennedy the order:

If *Goeben* attacks French transports, you should at once engage her. You should give her fair warning of this before hand.

While this message was being framed and transmitted, the chase continued in the direction of Messina. The German ships showed their speed superiority; in the afternoon the *Goeben* made over twenty-five knots and for a time exceeded the speed she had made on her endurance tests. The British battle cruisers had difficulty in making twenty-three knots; they were shorthanded and since the evening before had been under the strain of steaming at twenty-two knots. The *Indomitable* also was in need of overhaul and she soon began to drop astern. The *Indefatigable* was able to do better, but shortly after 4:00 P.M., she also lost sight of the quarry. It was about this time that the authorization to engage the *Goeben* if she attacked the French transports was received.

To get the full purport of this message it should be read in conjunction with the previous telegram sent on August 2:

Admiralty

To Commanders-in-Chief, all stations.

Today, August 2, at 2:20 the following note was handed to the French and German Ambassadors. (Begins) The British Government would not allow the passage of German ships through the English Channel or the North Sea in order to attack the coasts or shipping of France. (Ends). Be prepared to meet surprise attacks.

The note quoted in the above message was a solemn warning in the nature of an ultimatum that had been sent to Germany two days before. Although the *Goeben* had passed through the North Sea long before this note was written, and although no mention was made of the zone in the Mediterranean also under British surveillance in accord with the Anglo-French naval entente, the same principle was involved. The outstanding fact was that the *Goeben* had attacked the colonial possessions and shipping of France. The German government had had plenty of time to communicate to Admiral Souchon the contents of the note of August 2. Did it or did it not apply? Had Captain Kennedy sunk the *Goeben* it is a question to what extent, if at all, the integrity of Great Britain would have been compromised. The decision to sink the *Goeben*, however, would have carried a heavy weight of responsibility, and Captain

Kennedy cannot be criticized for not having made it. At that time he could not have foreseen that the *Goeben* was destined to escape and do such unusual damage to the Allied cause.

The wording of the authorization to engage *Goeben* if she attacked French transports is not entirely free from ambiguity. Did the *Goeben* have to be caught in the act? Did the bombardment of ports of embarkation and vessels within them constitute an attack on French transports? It would have been, perhaps, a liberal interpretation to have so termed it.

Nevertheless, at the time of this first encounter with the *Goeben,* which took place fifty miles off Bona at 10:53 A.M., August 4, had Captain Kennedy had before him both these messages, they would have supplied grounds for engaging the German ships in battle after having given them a fair warning.

The vindication of Captain Kennedy's decision not to attack is found in a later Admiralty message. Following a cabinet meeting held in London this same afternoon, a telegram was despatched that reached Admiral Milne, British commander-in-chief in the Mediterranean, at 7:00 P.M.:

Admiralty
To All Ships, August 4, 2:50 P.M.

The British ultimatum to Germany will expire at midnight, Greenwich Mean Time, August 4. No act of war should be committed before that hour, at which time the telegram to commence hostilities against Germany will be dispatched from the Admiralty. Special addition to Mediterranean, *Indomitable, Indefatigable.* This cancels the authorization to *Indomitable* and *Indefatigable* to engage *Goeben* if she attacks French transports.

In view of the Admiralty instructions to cover troop transports and to bar the way to Gibraltar, Captain Kennedy's tactics at the time of his meeting with the *Goeben* cannot be criticized. The *Goeben* first turned to the left and then to the right, making it quite clear that Admiral Souchon wished to pass to the east. Had Captain Kennedy been free to parallel her course at once and maneuver to keep ahead, then the *Goeben* either would have been compelled to go to the west or accept the company of the British to the east for a much longer period. The 108 mile wide passage between Sardinia and Africa would not have permitted a wide detour, and, in the time available, it is doubtful if the German ships could have made sufficient speed both to overhaul and to outdistance the British cruisers. Had Captain Kennedy known that no transports were at sea, and that the entire French fleet was between him and Gibraltar, he would have had arguments that might have justified the adoption of different tactics; but he did not have this important information. The Admiralty orders were explicit: to cover troop transports; and to bar the way to Gibraltar. Instead of holding the British ships to the eastward between the enemy and his objective, Captain Kennedy had to turn up astern of the *Goeben* and thus give the Germans a lead in the race which otherwise might only have been acquired after many hours of hard steaming.

In the German tactics used in this phase there is little to comment upon. Admiral Souchon has been criticized for permitting the British battle cruisers to pass so close aboard, but the only way to have prevented it would have been to flee to the west toward the French fleet and away from his goal, Turkish waters. With Sardinia fifty miles to the north and the African coast fifty miles to the south, he did not have sea-room for a wide detour to avoid the British. The German admiral estimated that the French fleet might be close at hand, en route for Bizerta. Also the *Goeben* did not have much coal, and time had already been lost in the feint to the west to deceive the French.

Although a British light cruiser was later on despatched from Bizerta to join in the work of shadowing the German cruisers, at nightfall Admiral Souchon succeeded in shaking off all his pursuers, and as the entrances to Messina were not being watched, he was able to make that port and leave his enemies still in doubt as to his whereabouts. This evasion paved the way for the subsequent successful break made by the *Goeben* and *Breslau* for the Dardanelles. The episode herein discussed was only one of a series of adventures that attended the strange and historic cruise of these lucky vessels.

All authorities agree that the arrival of the German cruisers at Constantinople had an important bearing on the course of the war, especially in the Balkan area; but opinions differ as to the extent of this influence. Mr. Morganthau, United States ambassador

to Turkey at this time, has recorded in his memoirs:

> I doubt if two vessels have ever played a similar rôle in history. Their entry into the Dardanelles, by sealing definitely the Turko-German alliance, was the logical sequel of all the intrigues and machinations that had been plotted during three years by Mr. Wangenheim, representative of William II at Constantinople. . . . . It was for this that the war has lasted so many years, because it was the decisive event that separated Russia from the Allies, which led to her defeat and downfall.

In reference to the escape of the *Goeben* and *Breslau*, Admiral Tirpitz, Germany's well-known minister of marine, has written: "The whole Turkish question received its definite favorable ending through the breaking through." General Ludendorf has given his opinion: "The entry of Turkey as an ally permitted Germany to continue the war two more years."

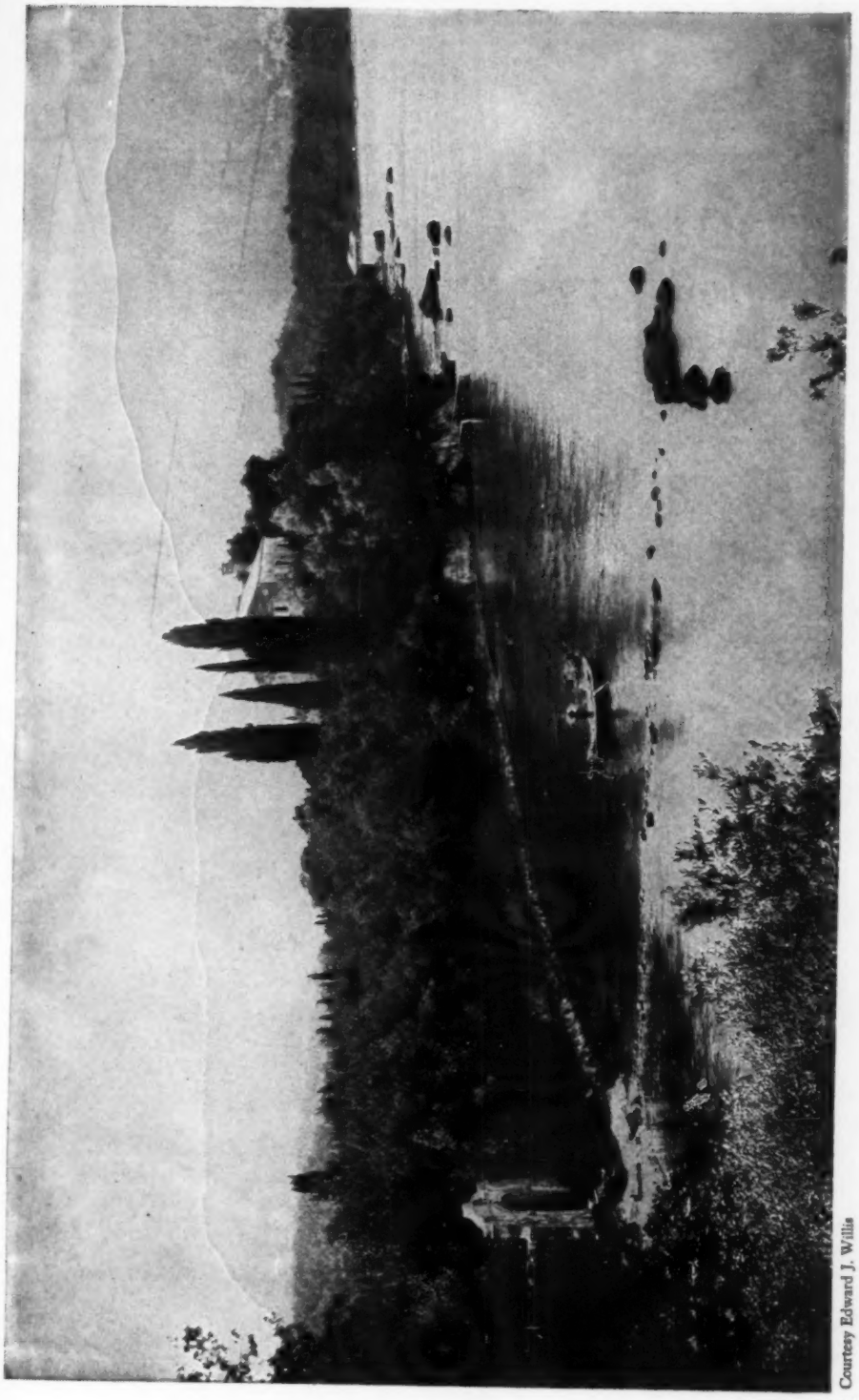
Mr. Winston Churchill, then first lord of the British Admiralty, has expressed himself in his book, *The World Crisis:*

> The *Goeben* was carrying with her for the peoples of the East and Middle East more slaughter, more misery, and more ruin than has ever before been borne within the compass of a ship. . . . . The evening of the tenth she entered the Dardanelles and the curse descended irrevocably upon Turkey and the East. . . . . Two parties were struggling for mastery in the capital, but in view of the Treaty of Alliance which had been signed on August 2, there could have been no doubt about the outcome. Moreover, in the *Goeben* and *Breslau*, to say nothing of the Turkish Fleet, Enver Pasha and the war party had the means to force the Turkish Government to adhere to the covenants which they had entered into on her behalf.

What would have transpired had the *Goeben* and *Breslau* been captured or destroyed by the French and British fleets is a question that can never be definitely answered; but it is not necessary to exaggerate the influence on the war exerted by the escape of these two cruisers. Without theorizing, certain positive results of Admiral Souchon's strategic victory can be stated: although a secret treaty of alliance with Germany had been signed on August 2, it was the arrival of the German squadron that forced Turkey's hand and hastened her entrance into the war as an active belligerent; the accession of two modern cruisers, fully manned by a trained personnel, transformed the almost negligible Turkish Navy into an effective force that supported the shore defense of the Dardanelles throughout the war and controlled essential water communications from the Mediterranean to the Black Sea; this Turko-German "fleet in being" compelled the Allies to maintain a considerable force on blockade duty at the entrance to the Dardanelles; in the person of Vice Admiral Souchon, the Turkish fleet received a commander-in-chief who was a competent organizer, and both the land and sea forces were thus brought under coördinated German control; during the first months of the war, when various Balkan states were divided in council and wavering in inclination, some parties favoring one side and some the other, these early German naval successes exercised considerable political influence; the achievements of Admiral Souchon were exploited to gain allies for Germany, while the friends of France, England, and Russia were depressed by a growing appreciation of the fact that in the escape of the *Goeben* and *Breslau* Allied sea power had suffered a defeat that carried unforeseen and sinister consequences.

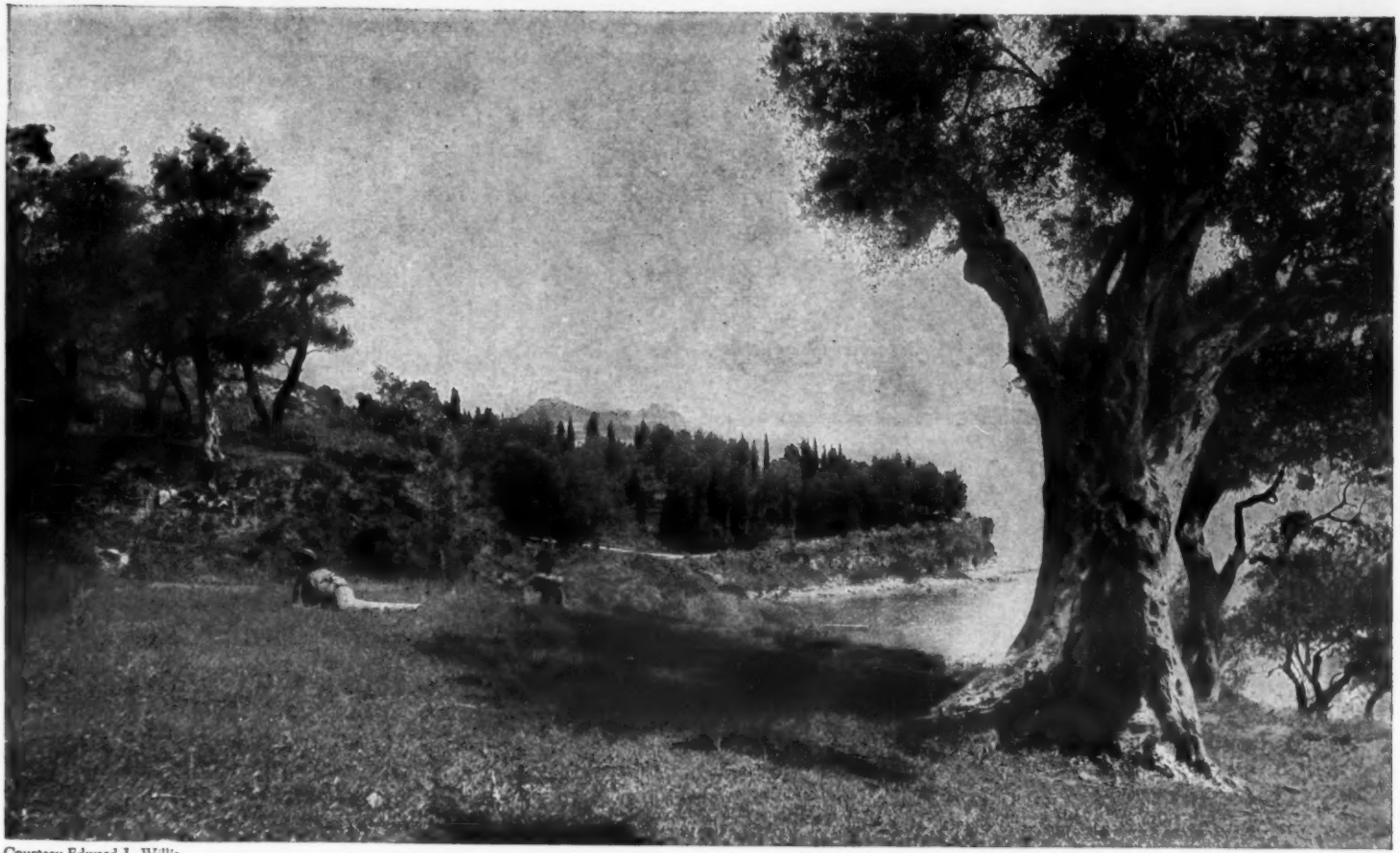
In the light of knowledge after the event, a feature of this campaign that holds the imagination is the fact that for a brief period in that forenoon of August 4, the *Goeben* and *Breslau* at short range were practically within the power of a superior British force. Captain Kennedy had almost, but not quite enough, grounds to justify a decision to open fire and end then and there the career of the *Goeben*. We now know what a great service would have been done for the Allied cause, what a saving in lives and in money would have resulted, had he availed himself of this opportunity.

But without this knowledge, acquired after the escape of the *Goeben* and the development of its unforeseen consequences, suppose Captain Kennedy had stretched a point and destroyed the *Goeben?* What then? In the temper of the time general opinion probably would have been: "What a shame to have done prematurely what was sure to have been accomplished a little later on with perfect propriety after the declaration of war." The award for the responsible naval officer would most likely have been a court-martial and general opprobrium. But this is conjecture and when one breaks away from the anchor of fact, wanderings become aimless. There is enough to think about in this episode without entering into the realm of fancy.



MONASTERY, CORFU

Courtesy Edward J. Willis



Courtesy Edward J. Willis

DISTANT VIEW OF FORTS, CORFU

DISTANT VIEW OF FORTS, CORFU

Courtesy Edward J. Willis

THE SHIP OF ULYSSES, CORFU

Courtesy Navy Recruiting Bureau, New York

CASTLE SANT' ANGELO, FROM POINTE EMMANUELE, ROME

CASTLE SANT' ANGELO, FROM POINTE EMMANUELE, ROME

Courtesy Lieutenant Commander Richard Wainwright, U.S. Navy (Retired)

THE BRITISH MEDITERRANEAN FLEET IN THE HARBOR OF VALETTA, MALTA, 1909

Part of the United States fleet visited Malta at this time, and found it to be one of the most interesting ports of the cruise.

Courtesy Navy Recruiting Bureau, New York

THE MEDERSA MOSQUE IN ALGIERS
Part of the fleet visited Algiers in 1909.

Part of the fleet visited Algiers in 1909.

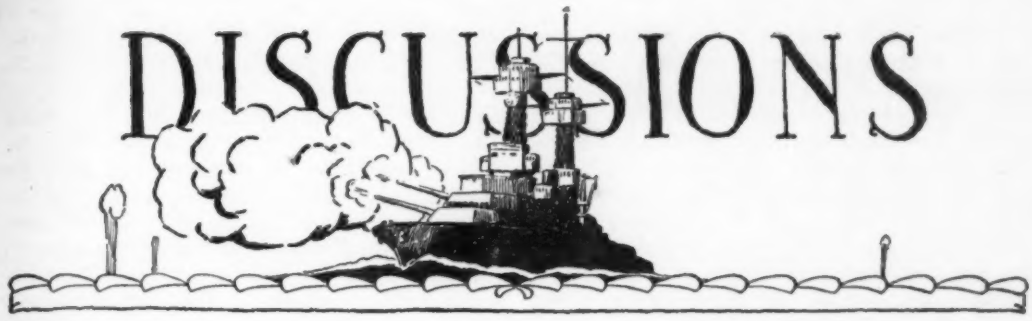
Courtesy Navy Recruiting Bureau, New York

FOUNTAIN AT PALAIS, LONGCHAMP, MARSEILLES, FRANCE
One of the ports visited by the fleet in 1909.

Courtesy Lieutenant Commander Richard Wainwright, U. S. Navy (Retired

THE CASINO AT MONTE CARLO

DISCUSSIONS



Naval Boilers

(See page 685, August, 1928, PROCEEDINGS)

MR. J. H. KING, *Associate Member, U. S. Naval Institute.*—Lieutenant Carl J. Lamb, U.S.N.R., repeats the erroneous statement that appeared in *The Engineer,* London, and was quoted in the PROCEEDINGS of March, 1928, pages 235 and 236, which said, "It is of interest to note that the boilers in both the *Saratoga* and *Lexington*—the highest-powered ships ever built—are of British design." This statement is entirely untrue and it is to be regretted that Lieutenant Lamb should premise on this statement his remarks that "such foreign-designed machinery is subsidizing foreign equipment builders because of the royalty money sent abroad."

The boilers for the *Saratoga* were supplied by the Babcock and Wilcox Company of New York, which, as is well known, was founded and is still owned and managed by citizens of the United States. These boilers were designed and built in the United States by the Babcock and Wilcox Company. The *Saratoga* boilers as well as similar boilers of this type are known as Babcock and Wilcox Express Type Boilers, but this boiler is often referred to as the "White-Forster" boiler.

The original White-Forster boiler was of British design, but many years ago the Babcock and Wilcox Company purchased the right to build and sell the White-Forster boiler, modified the design somewhat to meet the conditions of service in this country, and in addition made a number of specific improvements in design and construction. The modified boiler, as stated, is known as the Babcock and Wilcox Express Type Marine Boiler.

The boilers for the *Saratoga* are the largest boilers of this type that had, up to the time of installation, ever been built. No British design for boilers of this size and construction was ever made. These boilers are quite different in design from the original White-Forster boiler and were designed and built at the plant of the Babcock and Wilcox Company at Bayonne, New Jersey. Accordingly, not one penny of "royalty money" has been sent abroad.

The boilers on the *Lexington* are Yarrow boilers, designed and built in the United States. While the writer cannot speak authoritatively, as the boilers were built by another company, nevertheless, it is well known that the original Yarrow patents have expired and it is therefore quite certain that no "royalty money" was sent abroad for the *Lexington* boilers either.

A large number of the destroyers and scout cruisers are fitted with Babcock and Wilcox Express Type (so-called White-Forster) boilers, all of which, with the exception of those on the now obsolete destroyers *Warrington* and *Mayrant,* were entirely designed in the United States and all of the boilers were built in the United States.

The boilers for scout cruisers Nos. 24 to 31 now building are all to be equipped with this same type of boiler and all were designed and built in the United States.

In reference to the boilers for the treaty cruisers *Pensacola* and *Salt Lake City* and class, the statement of 700-pounds pressure is erroneous, as Lieutenant Lamb states. These boilers are designed for 300-pounds pressure and no superheat. In regard to these ships not being fitted with boilers for higher pressures, it should be noted that these cruisers are "treaty" cruisers and are limited to a total of 10,000 tons. Obviously, weight and space are paramount and it is essential that all machinery be as light as is possible, consistent with reliability.

The writer has been in close personal contact with these scout cruisers from their design stage and is therefore quite familiar with the facts concerning the selection of boilers for these cruisers. Previous to opening bids, the Bureau of Engineering advocated higher pressures for these ships. However, after a close study was made by the Navy Department and the successful shipbuilding contractor, it became evident that the increased weight, together with the lower boiler efficiency resulting from the higher boiler pressure in this express-type boiler, was not warranted. This situation is perhaps fully covered by the following paragraphs extracted from page 251 of the May, 1928, issue of the *Journal of American Society of Naval Engineers:*

> In the usual express-type boiler, an increase in pressure will result either in an increase in drum thickness or an increase in the ligament between tubes or both. If the drum thickness is increased very much, the weight of the boiler increases and for even a moderate increase in pressure, the plate required may not be practicable to use or even manufacture. With an increase in the ligament, the tube spacing is such that the boiler is not as good a heat strainer and so the boiler efficiency may drop off more in proportion than any possible gain may be obtained by the turbine. Therefore, with the limitations of weight and space required for the Navy, the present express type of boiler practically prohibits higher steam pressure in naval vessels.
>
> The solution of this problem lies in some new design of boiler that will be light, compact, and give a very high boiler efficiency with a resulting low stack temperature. The Babcock and Wilcox Company has been working on this problem for a number of years and expects to be in a position to offer such a boiler in the very near future.

There is absolutely no question of the very great economy to be gained by the use of higher pressures and temperatures in steam machinery. It is certainly to be expected that in the near future machinery will be designed that will meet the naval requirements of minimum weight and space so that the resulting economies with higher steam pressures and temperatures will be available for the Navy as they already are for merchant ships.

The Old Naval Auxiliary Service

(See page 592, July, 1928, PROCEEDINGS)

BROCKHOLST LIVINGSTON.—Commander Whitted's article brings to my mind the loss of the collier *Cyclops* in March, 1918. My father was then assigned to Barbados as consul. It was on a Sunday afternoon, March 3, if I remember correctly, that I sighted an odd-looking vessel entering Carlisle Bay. From pictures I had seen, I recognized her to be a naval collier. The signal station confirmed my belief. The consul immediately went on board and informed us upon his return that the ship was the *Cyclops,* bound from South America to "a port in the United States." She carried, as we all now know, a full cargo of manganese ore. She had touched at Barbados to take on bunker coal. One engine also was out of commission, I believe.

Upon my return from school the next afternoon, I found the master, George W. Worley, Assistant Surgeon Burt J. Asper, and Counsul General A. Moreau Gottschalk, of Rio de Janeiro, at the consulate for tea. Mr. Gottschalk was a passenger, as were also a number of prisoners from the then-existing South Atlantic squadron. Everyone seemed anxious to be back home. No one, of course, thought there was any danger in the voyage. Before leaving, the men signed my sister's autograph book and their signatures are probably the latest ones in existence.

About five o'clock our guests left and we watched them from the beach as they went on board. There were some blasts on the whistle and the *Cyclops* backed. Then, going ahead, she steamed *south.* We did not consider this course odd until a few weeks later we got a cable requesting full details of her visit to Barbados. The *Cyclops* was missing! No estimate of the situation was ever more thorough in "possible courses" than the one in this case. The master was German, the majority said. She had been sunk by the enemy, others volunteered. A dozen suggestions were made by amateurs, and all proved false. That she disappeared from natural causes is undoubtedly true. The absolute truth will perhaps never be known until the day when the seas roll back. The loss of life was great on this ship, 309 men losing their lives.

We have been told that position reports were sent in by the *Cyclops* after she left Barbados, but ex-Secretary Daniels, in his book, states that the last message received was the notice of her arrival at Barbados. The records of the Navy Department can clear up this question.

The visit of the *Cyclops* brought Barbados

near to the war. We then felt we were not completely out of the picture. The "home guard" even became more alert, expecting a raid from the enemy craft that had supposedly destroyed this valuable vessel. However, we never were paid the expected visit and we soon settled down to the routine of a self-satisfied island.

Commander Whitted concludes his article with the advice that "should a shortage of naval officers and men occur again and our auxiliaries have to be manned from other sources, reserve officers and reserve crews should be used." He is undoubtedly correct. It is this possibility that makes it imperative for us to "get going" on our merchant marine reserve and have the members sufficiently indoctrinated in naval procedure to become a part of the train in war time without endangering the whole fleet through lack of knowledge. Congress is getting more generous, but it still has a long way to go.

A Naval Research Reserve

(See page 976, November, 1928, PROCEEDINGS)

COMMANDER N. H. HECK, *U. S. Coast and Geodetic Survey.*—It is necessary to state my background with reference to the proposal of Captain McDowell in order that my viewpoint may be understood. My war experience was at the New London Naval Experimental Station as third in rank and responsibility under Captain McDowell for a considerable period and later I was associated with him at London Naval Headquarters. Since the war my duty in the Coast and Geodetic Survey has included application of methods developed during the war to speed up wire-drag work in the location of submerged pinnacle rocks and to the application of radio acoustic position determination and echo sounding to hydrography. At the present time I am in charge of the work in terrestrial magnetism and seismology. As a member of the division of physical sciences of the National Research Council and secretary of the section of engineering of the American Association for the Advancement of Science, I am brought into close contact with many of those concerned in the problem of a naval research reserve.

A brief review of the development of the Naval Experimental Station will bring out some points of value. It was developed in the emergency from almost nothing in personnel and material and with only a limited amount of preliminary research work elsewhere in the special problems. In a comparatively short time it was functioning and much valuable work was done, but there was much lost motion and many things were ineffectively done under great pressure which should have been finished before. As an illustration a member of one of the cooperating electrical companies was asked by me why certain apparatus put into use was only partially effective. He replied that in peace time five years would be required for experiment and test of such an apparatus while only a few months had been available in war time.

Obviously the same situation cannot arise again with the Naval Research Laboratory at Anacostia to serve as a nucleus for the development of such an organization as might be needed in emergency. This organization is doing useful work on naval problems, though restricted by limited appropriations. With all the work that can be done there and elsewhere in all the various activities of the Navy, naval problems have grown in complication so that without some such plan as that proposed another emergency might find the same relative situation. An obvious example of an increase in complexity is the very different needs of antisubmarine defense as compared with 1917. It is essential that all important problems be solved in peace time and that only new problems be left for the emergency since in most naval wars no such time is available as there was in the last war. No one in this country wants war but it is the duty of the Navy to be prepared.

It will not be as easy to organize an effective research reserve as it has been for the other branches. There are scarcely two types of man whose training and methods are so far apart as the line officer and the research worker. One cannot become a specialist and the other must do so in order to succeed. One must produce immediate results under difficult conditions and the other is open to the criticism of omitting some consideration if he produces results too quickly, and often a year of study must be spent on a problem. A characteristic naval attitude was that of an officer commanding a naval destroyer in European waters dur-

ing the antisubmarine campaign. He strongly resented the necessity of remaining in port for the installation of antisubmarine devices. A little later after a few successes he wanted to know why these had not been installed long before.

The form of organization suggested by Captain Nimitz is necessary. He realizes the differences in viewpoint that I have mentioned and makes it clear that not every type of naval officer can be effective in this duty. Understanding and patience are two essential requirements. The research worker has certain peculiarities, often an intense individualism and a single-track mind. Organization of research is tending to change this but there are some research workers who would not fit into the proposed plan.

I realize Dean Probert's viewpoint in his comments in the November number when he states that rank and recognition are relatively unimportant. He means that the research worker is not interested in this part of the problem. I am compelled to take issue with him in both matters. A research reserve officer can accomplish little and would soon become dissatisfied unless his rank is appropriate to the character of his work. His very position on board a battleship is dependent on his rank. It seems doubtful to me whether the plan can become wholly successful unless there is provision for rank above lieutenant commander in a limited number of cases. As to recognition research workers are human and they are all appreciative of recognition. I know several prominent scientists who would be happier today if their important contributions to the Navy during the war had been recognized. The restriction of medals and other forms of special recognition to the regular naval personnel as was almost entirely the case in the World War will have to be changed if full success in the proposed plan is to expected.

Captain McDowell has emphasized the important results of such investigation in the solution of problems important to the merchant marine and to commerce and industry in general. There is no doubt that there would be such results. However the aim should be the solution of naval problems. Very often a slight change in an already organized research would solve a naval problem. I believe that constitutional authorities hold that the function of the Navy is to provide for the common defense and only indirectly to promote the general welfare.

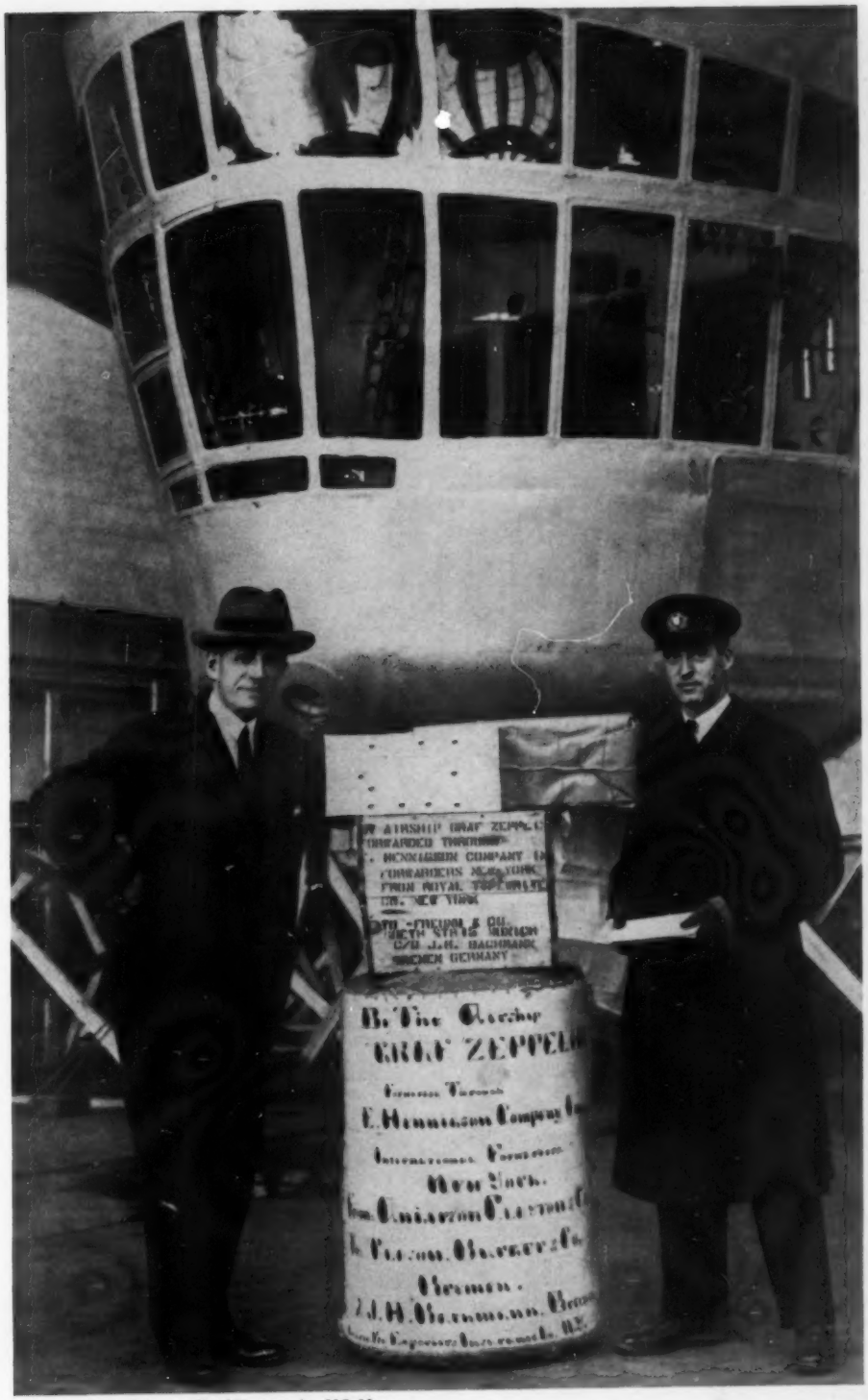
The relation with private research should not be carried too far. American individualism should be preserved and organized research tends to lose some of it. There is a strong tendency for the scientific branches of the government to restrict investigations to matters of immediate practical value. If this were applied to research as a whole the work would eventually come to an end. At New London many new facts were found about the physics of sound and it became necessary for one investigator to stop his work on applications and to devote most of his time to pure research in order that his colleagues might not go in a wrong direction.

It is essential to the success of the plan that a liberal and correct policy with regard to patents be worked out if this has not already been done.

The relation of the National Research Council to the proposed plan is important and full utilization of its resources by the Navy in this matter would be of mutual benefit. In the executive order of President Wilson of May 11, 1918, it is stated among other things that its purpose is to direct the attention of scientific and technical investigators to the present importance of military and industrial problems in connection with the war and to aid in the solution of these problems by organizing specific researches.

In conclusion it seems to me that Captain McDowell has found the solution to the problem of obtaining from the work of research laboratories and university investigations results of great importance to the Navy. The Navy's problems are difficult but they are not incapable of solution provided there is thorough analysis, and a desire to solve them.

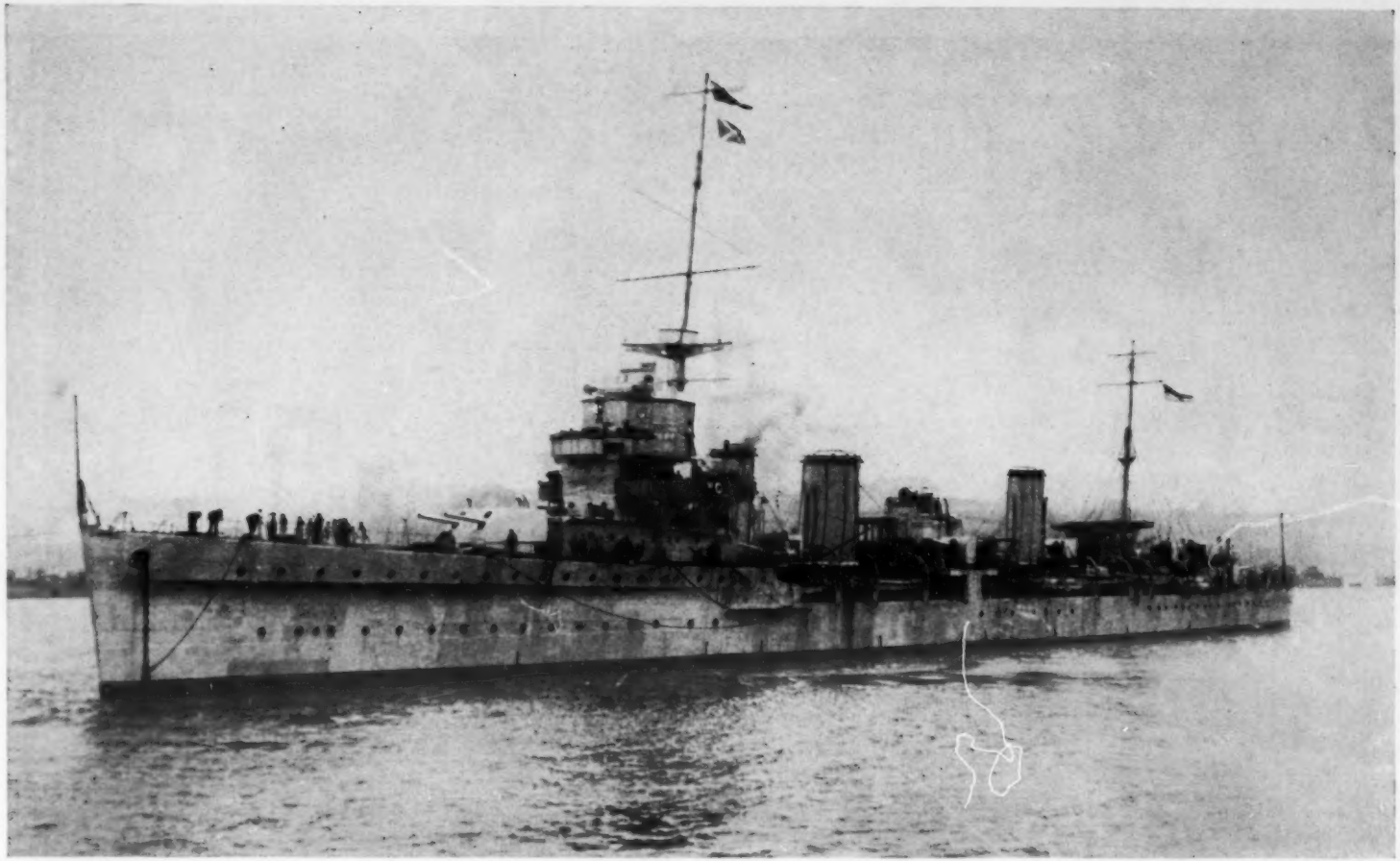
The invention of Greek fire was stated to have been worth thousands of men in the first naval defense of Constantinople in 717; the availability of antisubmarine methods in use at the end of the war, in 1915 would have produced incalculable changes in history. The utilization of the immense resources of the country in the solution of naval problems may add immeasurably to the strength of the Navy without commensurate increase in cost.



Courtesy Walter Johnson, Chief Photographer U.S. Navy

CAPTAIN VON SCHILLER OF THE *GRAF ZEPPELIN* AND THE NEW YORK REPRESENTATIVE OF THE ZEPPELIN COMPANY

Checking some of the first east-bound trans-Atlantic air freight—a typewriter and various other articles.



International Newsreel

HIS MAJESTY'S CRUISER *ENTERPRISE*

Ordered to Dar-es Salam, Africa, to speed the Prince of Wales and the Duke of Gloucester to London to the bedside of the stricken King.
The *Enterprise* is capable of thirty-five knots.

PROFESSIONAL NOTES

4 November to 3 December

Compiled by

Commander F. W. Rockwell, U. S. Navy

Lieutenant Commander A. C. McFall, U. S. Navy

and

Professor Henry Bluestone, U. S. Naval Academy

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GREAT BRITAIN

Some Impressions of the Fleet

The Engineer, October 26.—During the present month we have had exceptional opportunities of watching the Navy at work, and we believe that some of the impressions gathered during a week's cruise with the Atlantic Fleet in Scottish waters will be of interest to our readers. It has always been our conviction that every critic of naval affairs, whether from the technical or the political aspect, should from time to time refresh his knowledge by personal contact with the Navy itself. This may seem a platitude, yet the fact remains that there are writers who, judging from what they write, rarely, if ever, board one of his Majesty's ships, let alone go to sea in such a vessel to observe for themselves what the Navy actually is, what it is doing, and why it is doing it. This is a privilege which cannot, of course, be extended to everyone; but, thanks to the sagacious policy of the present Board of Admiralty, it is now granted more readily than heretofore to the properly accredited naval student. The occasion in question was of particular interest, in that it coincided with some of the most important phases of the autumn program of fleet training. We would like here to express our profound appreciation of the most courteous treatment which we received from the Admiralty, from the commander-in-chief of the Atlantic Fleet, and from the officers of the several ships in which we were temporarily accommodated.

The Fleet itself was practically at full strength, the only notable absentee being the *Iron Duke,* erstwhile flagship of the Third Battle Squadron, which is undergoing a large refit at Portsmouth. Eight capital ships were present, among them being the mighty *Nelson* and *Rodney,* the still larger *Hood,* and the sister battle-cruisers *Renown* and *Repulse.* The Fleet Air Arm was greatly in evidence, for in addition to the aircraft borne in the *Furious* and *Argus,* machines from the R.A.F. station at Novar took part in the exercises. It is no secret that the Navy is short of cruisers, a deficiency made manifest by the composition of the only cruiser squadron—the Second—attached to the Fleet. Its flagship is the *Vindictive,* a unit of the *Hawkins* class, which was originally completed as an aircraft carrier and has since been re-converted, the other three ships of the Squadron being the *Canterbury, Cambrian,* and *Comus,* all of which saw hard service during the war and will soon have passed the limit of effective life. Though by no means devoid of fighting value, vessels of this type are too small and of too limited a radius to be employed on the ocean routes. The new Australian cruiser *Canberra* arrived in Cromarty Firth towards the end of our visit, unfortunately too late to take part in the operations which we witnessed. She is identical with the Royal Navy cruisers of the *County* class, whose splendid nautical qualities have already become proverbial throughout the service. The *Hawkins* class is, of course, of much older design, dating from 1916, but having spent a day in the *Vindictive* in Moray Firth in half a gale of wind, we can testify to the splendid behavior of these ships in a seaway. They are wonderfully steady gun platforms, their motions in a rough sea being considerably less lively than those of certain passenger liners, of much greater displacement, which we could name. In addition to the larger vessels mentioned, we made short cruises in destroyers of the Admiralty "W" class and a submarine of the later "L" class.

Conspicuous among the ships, great and small, that were anchored in Cromarty Firth was the ex-battleship *Centurion,* now fitted out as a target ship. To those who love ships for their own sake she presents a rather melancholy spectacle. All the big guns and much of the top hamper have been removed, and seen at a distance she gives the impression of being a useless derelict hulk. Any such idea however, is entirely misleading. We are told, and could well believe, that the *Centurion* in her new rôle is of more value to the Navy than if she were a fully equipped battleship. Thanks to her, the gunnery practice of the Fleet can now be conducted under the most realistic conditions. By an elaborate system of wireless control, into the details of which we do not propose to enter, this great ship of 24,000 tons, without having a soul on board, can be made to simulate all the movements of a fully manned ship. When she is required to act as a target her officers and men go on board the destroyer *Shikari,* in which vessel duplicate control positions are installed. Radio waves from the destroyer

actuate motors in the *Centurion* which regulate the main steam valves, the supply of fuel oil to the furnaces, and the movements of the helm. By this means the deserted battleship can be made to steam ahead at speeds up to 16 knots, to go astern, or to stop; to turn so many degrees to port or starboard, and to send up a smoke screen such as a ship in action might put up to blind the hostile gunners. The ordinary battle practice target can do none of these things, and owing to its lack of stability it can only be towed at low speed. Hence the value of such a ship as the *Centurion*, which enables our naval gunners to practice shooting under conditions which closely resemble those of actual warfare.

The crew of the *Centurion* may be said to lead double lives. Officers' cabins and seamen's quarters are in duplicate, one set being above the waterline, the other below. Before every "shoot" all personal effects and portable furniture are removed from the upper to the lower quarters, where they are protected by the stout belt armor. When the practice is over they return to find, as a rule, the whole upper part of the ship in a state of ruin. On the day of our inspection the ship had just come through a particularly severe bombardment. It is no exaggeration to say that her sides above the main belt were riddled like a sieve. Not a single sensitive point had escaped shells or splinters. Apart from damage on the lower deck there was a scene of utter havoc in those very places where officers and men would congregate in action. Every story of the bridge and its screens was ripped with flying fragments of metal. The foremast had received several direct hits, and the foretop had sustained the full force of a direct burst. The sick bay, the captain's cabin, and all save one of the officers' cabins had been laid waste. On the armored deck there were gashes and furrows beyond counting. We will say nothing of the numerous direct hits which, had they been inflicted by fully charged shells, must have caused severe injury to material and personnel. Looking at this scene of devastation, we were thankful that the views of the anti-armor school have not prevailed in our latest ships. We hope, and believe, that the object lesson taught by the *Centurion* after every bombardment will not only tend to improve the quality of the Fleet's naval gunnery, but will exercise a salutary influence on the design of our future men-of-war. We have no hesitation in affirming that so long as a ship is liable to be exposed to the fire of guns of any considerable caliber, adequate armour protection to every vital position is indispensable. Should there be any who question this dictum, we would invite them to inspect the *Centurion* at the end of a day's "shoot."

During recent years no technical question has been more hotly discussed in naval circles than the design of the *Nelson* and *Rodney*. Superficially, at any rate, they transgress all the accepted canons of naval architecture, but having seen them "in action" one conceives for them a new respect as fighting machines. We watched both ships engage in a full-caliber shoot with their 16-inch turrets at a range that would have seemed fabulous not so many years ago, and, having enjoyed the scenic effect of the tremendous flash and the billows of tawny cordite smoke, we turned our glasses on the target just in time to see the mighty water spouts that denoted the arrival of the huge shells. A heavy sea was running at the time and visibility was none too good, yet almost every salvo was a "straddle," though the range, we are permitted to say, was approximately twelve miles. Later in the same day we saw the ships of the Second Cruiser Squadron take under rapid concentration fire a target distant at a range considered, before the war, to be impracticable even for heavy guns. On this occasion, however, only 6-inch guns were at work, and within less than a minute the target was literally hidden from view by the "overs" and "shorts" of straddling salvos. It is certain that no ship other than a heavily armored capital unit could have survived this torrent of projectiles. It is equally certain that British naval gunnery has made so much progress since the war that bases of comparison between the performances of 1918 and 1928 can scarcely be said to exist. We should add that the results recorded above were the more impressive in that they were achieved in very difficult circumstances, the firing ships being under helm at the time, while the range, course, and speed of the target were unknown quantities.

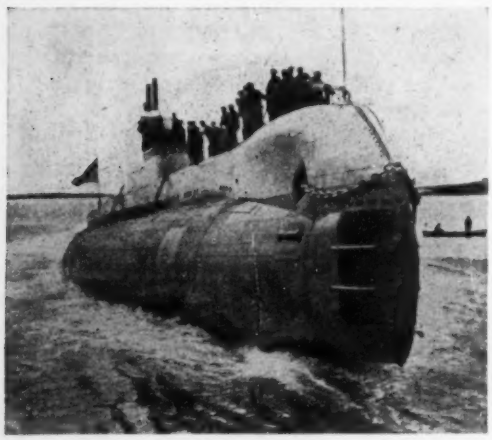
If space permitted we would like to give some description of our day in H.M.S.

Furious, the ship in which the flying-off and on of aircraft at sea has been reduced to a fine art. The amazing celerity with which groups of machines are brought up from the hangars, projected into the air, and received on deck after flight must be seen to be believed. Simplicity is the keynote of the whole system, but the results are not the less impressive on that account.

Summing up our impressions of a week crowded with variegated experiences, we would say that the Navy is doing its utmost to justify the trust reposed in it by the nation. If professional zeal and hard work are the criteria, we have no hesitation in placing it first among the departments of the State.

Chilean Submarine "Capitan O'Brien"

Marine Engineer and Motorship Builder, November.—The Chilean submarine *Capitan O'Brien* was launched on October 2 from the yard of Vickers-Armstrongs Limited, Barrow-in-Furness. She is similar to the British "O" type craft, and has Vickers oil engines.



THE CHILEAN SUBMARINE *CAPITAN O'BRIEN*

UNITED STATES

Naval Policy

Washington *Post,* November 14.—The statement of the naval policy of the United States as formulated by the general board is supported by the people as well as by the present and the incoming administrations. It represents the settled purpose of this Nation. "The fundamental naval policy of the United States," says the general board, "is that its Navy shall be maintained in sufficient strength to support United States policies and commerce, and to guard its continental and overseas possessions."

The size of the Navy will be in accordance with treaty engagements. Replacement ships will be designed to insure superiority of armament and greater radius of action. No more small cruisers will be built. The general board's policy contemplates the replacement of all old cruisers with modern cruisers of 10,000 tons displacement, carrying 8-inch guns, and, in addition, to build similar cruisers at a rate that will maintain effective cruiser tonnage in conformity with the capital ship ratio. The newly stated naval policy also provides for encouragement of civil aviation and support of American interests in developing the merchant marine. Plans are to be made for the rapid conversion of suitable merchant vessels into aircraft carriers.

This formal statement of policy follows the illuminating address of President Coolidge on Armistice Day. Taken together, these official utterances make plain the settled purposes of the Government, and inasmuch as these purposes are those of the people of the United States it may be confidently assumed that Congress will adopt the policy and program. The first action by Congress is expected to be the enactment of a pending bill providing for fifteen 10,000-ton cruisers and an airplane carrier.

No competition with foreign naval powers is involved in this policy and program. The needs of the United States are the sole measure of the steps that are to be taken to bring up cruiser strength, to maintain capital ship strength, to increase the efficiency of the naval air force, and to render the merchant marine a serviceable auxiliary of the Navy. All these plans are within the scope of treaty stipulations.

There is hope that the powers will agree to limitation of naval strength. The United States stands ready to make such an agreement. But it should be borne in mind that the normal defensive needs of the United States will not be affected by any limitation agreement. This Nation will still be obliged to maintain its Navy "in sufficient strength to support United States policies and commerce, and to guard its continental and overseas possessions." Other powers

will maintain navies according to their needs. Whether another limitation agreement be reached or not, the United States will need the cruisers, aircraft carriers, and other ships that the general board has planned. With all the new vessels in commission the United States Navy will still be inferior to the British navy in cruiser strength; so that the pacifist cry against new American cruisers is entirely without fairness or common sense. The true American note is sounded by such men as President Coolidge, General Pershing and the national commander of the American Legion.

MERCHANT MARINE

Problems of the American Shipbuilders

The Nautical Gazette, November 24. By H. G. Smith.—Speaking before the Middle West Foreign Trade Committee in Chicago last week, H. G. Smith, vice-president of the National Council of American Shipbuilders, pointed out that one reason for the depressed condition of the shipbuilding industry today is the continued existence of the idle Shipping Board Fleet which consists of about 500 vessels. "A large number of these vessels are wholly useless to form a part of a permanent American merchant marine, but they will be a menace to new construction until their status is definitely determined," he said. "It would be for the best interest of the American merchant marine to have these vessels classified into those of value for further use; those that may be useful in a non-registered class only, and those that should be scrapped."

Mr. Smith presented the subject of the American shipbuilding industry in a comprehensive and lucid manner and included in his treatment of it everything except the handicaps and problems facing the American shipowner.

Market For Ships

Shipyards have three possible sources of demand for new construction, according to Mr. Smith. They are:

A. Navy and Coast Guard Service.
B. Shipping Board.
C. Private Shipowners.

He brought out that the private shipyards now have contracts for only five naval vessels, and that there is legislation pending in Congress that authorizes the construction of fifteen cruisers, and one airplane carrier. This is a five-year program, and if enacted, the bill requires the compulsory building of eight of the fifteen cruisers in government navy yards. The National Council of American Shipbuilders is opposed to this provision, he said, on the ground of higher cost of construction of vessels if built in government navy yards; and because it deprives the private yards, in the time of peace, of the work they need to equip themselves thoroughly for service in time of a national emergency; and, when a national emergency arises navy yards can perform only repair work, and any uncompleted vessels in the course of construction in the navy yards at that time would prevent them from properly prosecuting repair work.

"The outlook of the private shipyards for new work for the Navy is very uncertain, but if it chooses to do so, the Government is in a position to aid materially in improving the condition of the private shipyards by building therein a large majority of these new naval vessels," he said. "At any time the total volume of new construction for all other government departments in private shipyards is a very small fraction of their total business. Work for the Shipping Board since the war has been confined wholly to reconditioning of existing vessels; no new construction is under way for the Board."

The shipbuilder must, therefore, rely wholly upon the private shipowner for his existence, according to Mr. Smith. The private shipyards cannot expect to build any merchant vessels for foreign countries. The reason is that it costs from fifty to sixty per cent more to build a merchant vessel in the United States than to build a similar vessel in Great Britain. This difference exists with a normal volume of business in both the American and British shipyard, and is greater when the American shipyard is operating below its normal capacity. This condition is due almost entirely to higher wages in this country than abroad and to the further fact that shipbuilding is highly specialized and not a quantity production industry. This differential in first cost against the United States will continue as long as wages are higher in the United States than in foreign countries engaged in shipbuilding, he said. The differential in cost of ship

construction between the United States and Germany or Italy is even greater than that between the United States and Great Britain.

Before considering the future prospects of shipbuilding for the private owner, he said it would be well to consider the importance of the American shipyard to our country and he stated that it has three important functions:

A. As an industry.

B. As a factor of national security.

C. As a source of supply of vessels for the merchant marine.

As an Industry

"It may be surprising to my listeners to hear that only about thirty-nine per cent of the cost of building a large passenger vessel is expended at the shipyard. A careful breakdown, as made by the National Council of American Shipbuilders, under my direction, of the cost of building a $15,000,000 transatlantic combination passenger and freight vessel shows the following results:

Material purchased by shipyard	$7,620,000	50.8%
Freight paid by shipyard.....	690,000	4.6
Taxes, insurance, fees, depreciation	840,000	5.6
Labor at shipyard	5,850,000	39.0
Total cost of ship	$15,000,000	100.0%

"From the above statement it will be noted that of the total cost 50.8 per cent is paid for material manufactured or constructed at various places throughout the United States; 4.6 per cent to the railroads for the transportation of material; 5.6 per cent for taxes, insurance, fees and depreciation, and the remainder thirty-nine per cent for shipyard labor.

"The production of each purchased item involves both labor and material at the point of manufacture, and practically every state in the Union shares in the production of the materials used by the shipyards in the building of a vessel. Our detailed analysis shows that the state of Illinois would supply material for this vessel to the value of $92,000; state of Indiana $235,000; state of Michigan $260,000; and the state of Wisconsin $92,000 for such items as limestone, wood alcohol, lumber, valves, paint, coke, electric motor refrigerating machinery, pumps, hardware, iron ore, plywood, furniture, soot blowers, copper, small tools, and other miscellaneous equipment.

"If we take account of the labor cost at the shipyard and trace each item of material back to the mines, the forests and the fields, we will find that about seventy-eight per cent of the total cost of a vessel is expended for labor.

"The thirty-nine per cent for labor at the shipyard represents about sixty different trades. The 50.8 per cent of material ordered by the shipyard from various sources represents almost every known industry and trade in the United States. The value of a shipbuilding contract, therefore, is not confined to the shipbuilder but is well distributed throughout the entire nation.

Volume of Work Needed

"It has already been shown that the principal requirement for the maintenance of an adequate and efficient shipbuilding business is a volume of work that will keep employed a normal staff of efficient technical employees and mechanics. This is only possible if there is a market for ships. The Merchant Marine Act of 1920 established a Construction Loan Fund from which money could be loaned for the construction of new vessels either in the coastwise or in the foreign trade. Of this fund about $20,000,000 was used to aid the construction of fifteen vessels. The Act contained numerous provisions which, it was expected, would aid in the upbuilding of the American merchant marine and would consequently give work to the American shipyards. The Act failed in this respect largely because several of the important provisions were never enforced, and, because of the existence of the very large war fleet of merchant vessels already mentioned, no new vessels for general carriers in the foreign trade have been built under the act."

In Great Britain the Trade Facilities Act went into effect in 1921 for the purpose of encouraging building of new merchant tonnage, and of keeping the shipyards in an efficient operating condition, Mr. Smith said. Great Britain had promptly disposed of her excess merchant tonnage after the World War so that the Trade Facilities Act promoted the building of new tonnage. Under the Act $118,000,000 was loaned from 1921 to 1926, about fifty per cent of the total cost of the vessels for which the money was loaned. Some of this money

was actually expended for the construction of foreign vessels. In addition, northern Ireland loaned about $20,000,000 for the same purpose. Italy has in the meantime encouraged its shipbuilding industry by paying a subsidy to shipowners to aid them in the construction of merchant vessels in Italian shipyards. Incidentally this subsidy has been largely paid out of loans floated in New York and London. Other foreign countries have rendered aid to shipbuilding of a similar character, he said further.

Construction Costs

"Let me repeat that the cost of construction of vessels in the United States is higher than in foreign countries, and the cost of operation of American vessels is greater than the cost of operation of foreign vessels. These conditions, with the severe competition between American vessels and foreign vessels in foreign trade, have made bankers hesitate to invest in American marine securities, except under conditions that are burdensome, to the ship owner—a condition that can be changed only by evidence of profitable operation of domestic vessels. Foreign marine securities are readily sold in the United States which is evidenced by the fact that the North German Lloyd was able to sell in the United States during 1927 $20,000,000 of its securities, the proceeds from which are being used to build new vessels, and it is understood that these lines are now negotiating additional loans with American banking institutions. It is reported that the action of the North German Lloyd is to be followed by a similar move by the Hamburg-American Line to finance the building of new vessels with American capital.

"Furthermore, the Cunard Steamship Company and the Italian Credit Consortium have negotiated sales of their bonds in the United States, the former $7,500,000 in 1925 and the latter $12,000,000 in 1927, the proceeds of such sales will be used for the construction of new vessels.

"The purpose of the Trade Facilities Act of Great Britain is similar to that of the Construction Loan Fund of the Merchant Marine Act of 1920. But the British Act in its operation preserved the British shipyards, while the Merchant Marine Act of 1920 failed to accomplish this object for the reasons already given, which is confirmed by the closing of numerous American shipyards, which could not stand the financial burden imposed upon them by a lack of work.

"The sentiment of the American people is undoubtedly in favor of an American-owned and American-built merchant marine. This sentiment was demonstrated at the hearings held in 1926 by the United States Shipping Board in various cities throughout the United States and by the report of the Board to Congress. It was further confirmed by Congress when it enacted the Jones-White Bill last May and known as the Merchant Marine Act of 1928. This Act is the most constructive of any merchant marine legislation enacted by Congress, and I am confident will create a demand for a considerable amount of shipbuilding in the United States. The Postmaster General has already entered into twenty contracts with shipowners for the carriage of mail in vessels operating in foreign service, each of which, it is expected, will in due course require new ship construction. The W. R. Grace Company has ordered a new freight vessel of the capacity of about 7,000 cargo tons for foreign trade to operate at 18-knot speed and to carry 175 passengers. The Export Steamship Company recently opened bids for the construction of four vessels of 14-knot speed with accommodations for 100 passengers and a freight capacity of about 6,500 tons. No contracts have been placed, however, for these vessels.

"Enough time has not elapsed to determine whether the Merchant Marine Act of 1928 will be sufficient without supplementary legislation to establish our merchant marine in the foreign trade, but a considerable number of new vessels will undoubtedly be built under its provisions. Despite the depressed condition of the shipbuilding industry, the American shipbuilder has nevertheless spared no effort to reduce the cost of construction and to perform his duty in helping to upbuild the merchant marine. Since 1914 the cost of shipbuilding has increased, due, among other things, to requirements for greater safety of operation of vessels and for the comfort of passengers and crews; and more efficient machinery. Notwithstanding the increased cost, a recent analysis of shipbuilding made by the National Council of American Shipbuilders

shows that even if these more costly requirements are included the selling price of ships today has advanced over the selling price of 1914 by only an amount represented by the increase in labor and material costs. This increase is about ninty-four per cent above the 1914 prices, of which the greater portion is represented by wages which have more than doubled since that time. Reductions in cost can be expected as the volume of work in the shipyards increases. For the first time in many years the National Council of American Shipbuilders feel assured that an adequate merchant marine of American-built and American-owned vessels for foreign trade is in the process of permanent establishment, due, in a great measure, to the Merchant Marine Act of 1928.

"As I have stated, time only can tell whether the Act contains all that is necessary to accomplish this result. If supplementary legislation is found to be necessary, I am confident that Congress will approach the problem with the same sympathetic and helpful spirit that inspired it to enact the Jones-White Bill with assurance that it will have the support of the people of the United States, who realize now, as they never have, that a merchant marine is necessary if they hope to meet successfully the organized effort of foreign nations to market their products and to overcome the intense competition that this effort is creating and which confronts the American trader in all avenues of foreign trade."

ENGINEERING AND RADIO

Pulverized Coal Burner in Final Test

The Nautical Gazette, November 24.—Official tests concluded last week on the new type pulverized coal burners, at the Fuel Oil Testing Plant at League Island Navy Yard, have effectively demonstrated the application of individual pulverizing mills for each burner.

Complete data will not be available until all analyses have been made. Evidence at hand, however, together with the consensus of opinion of the engineers in charge of the test, indicate a splendid showing of combustion conditions and that the over-all efficiency of the burner and boiler exceeded expectations.

These tests were the direct result of experiments made by the Todd Dry Dock Engineering and Repair Corporation over a period of two years in their Brooklyn plant. Many different types of burners were used, as well as different applications of primary and secondary air conditions.

Up to this time all experimentation has been confined to the burning of pulverized coal in the furnaces of Scotch marine boilers, marine engineers generally conceding that this was the most difficult condition to meet. With the successful accomplishment of this, the aim was to develop an apparatus that would have a universal application, regardless of whether the present fuel being burned was oil or coal on the grate, and having in mind that cost of apparatus and its installation, together with its weight and bulk and simple method of operation, were all features of vital importance to the ship operator and owner. In comparison to systems heretofore used aboard ships, there is a very decided difference in weight in favor of the Todd System.

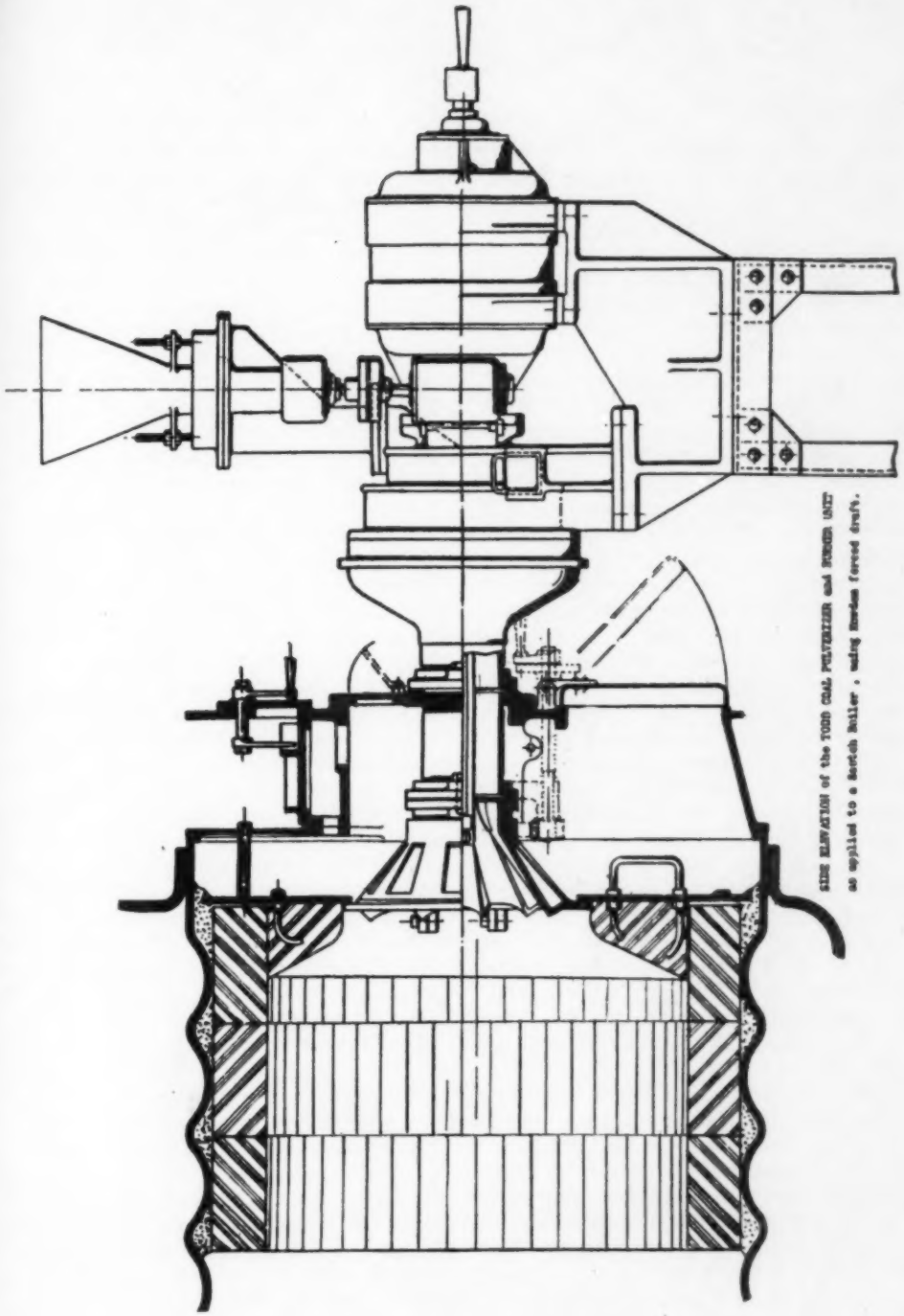
The apparatus which was finally developed and used in the tests is a remarkably simple machine, consisting of a motor or turbine-driven impact mill with two stages of pulverization, containing a fan to furnish primary or carrying air, and feeding apparatus to regulate the amount of coal going into the mill.

The equipment is very compact and rugged, a complete unit is installed on each furnace front. The flexibility of such an installation is an outstanding feature and will appeal to all operators, since it now becomes possible to operate all fires independently. No one unit is in any manner dependent upon its neighbor.

Shipowners will appreciate the fact that it will not be necessary to alter bunkers or hull structure in any way to make an installation of these new type burners or for any system of coal conveying from bunker doors to pulverizers.

Burning of pulverized coal will always require the attention of operators, but when this feature is reduced to the simple manipulation of secondary air and amount of coal fed into the pulverizer as in this new type, it is then reduced to a minimum and comes within the easy range of the usual fireroom attendant.

The burners demonstrated were applied to a regular form of Howden forced draft front, with only such changes to the front



SIDE ELEVATION of the TODD COAL PULVERIZER and BURNER UNIT as applied to a Babcock Boiler, using Howden forced draft.

itself as are usually made when changing from coal to oil burning, and the secondary air coming from the Howden fan was approximately of the same pressure as used when burning coal on the grate. This is of importance since it admits of the use of the same draft fan and ducts as exist in the ship, and does not destroy the usual coal-on-the-grate operation, should that for any reason be desirable.

The capacity of the burners demonstrated has been shown to be from 200 pounds to 600 pounds per hour per burner; this range is well within any requirement usually found on a Scotch boiler furnace, and this circumstance added to the fact that all burners are independent of each other, makes for a flexibility very much to be desired.

The grade of coal burned had a British thermal unit value of about 14,000, and due to the fineness of pulverization and complete combustion there has been no ash trouble, as most of the ash is fine enough to pass away with the gases through the stack.

The flame produced is a short turbulent one and due to its turbulence the inert gases, usually found between the flame and heating surface, are brushed away, thus increasing the evaporating efficiency of this heating surface.

On November 13 a company of representative shipowners and operators, together with the Fuel Conservation Committee of the U. S. Shipping Board, paid a visit to the Fuel Oil Testing Plant for the purpose of witnessing the Todd Pulverized Coal Burners in operation during the final period of very exhaustive tests made by Navy and U. S. Shipping Board personnel, and consensus of opinion was that these burners were a very fitting tribute to the business of burning pulverized coal, and there were many expressions of satisfaction with this new development.

The Todd Corporation has a number of inquiries from shipowners which indicate a very keen enthusiasm in this subject by interested parties, and they expect to make an installation aboard a freight ship in the very near future, which, no doubt, will be watched by others equally anxious to equip their ships.

Radio Used as Airplane Altitude Indicator

New York *Times,* November 25.—Dr. E. F. W. Alexanderson, of television fame, in an address delivered at the recent meeting of the National Academy of Sciences at Schenectady, proposed to determine the height of an airplane above the ground by using a radio echo.

The main object is to measure the distance that the reflected wave has traveled when it returns to the antenna. This distance may be measured in two ways, by the strength of the returning wave which in its turn determines the amount of frequency change; and by the number of cyclic changes in phase which the wave has passed through before it returns. The indications may be oral, graphic, or visual or in the nature of a warning which would call the operator's attention when certain limiting values had been exceeded.

"In the measurements so far made," said Dr. Alexanderson, "we have used an instrument that traces a graphic record of the frequency variations. Quite a number of such records have been taken. Up to altitudes of 4,000 feet the cyclic nature of the frequency variations is unmistakably shown by the record. Observations were also made on a barometric altitude meter and the observations were written down on the graphic record, during the progress of the flight. We have thus observations of altitude by two independent means set down side by side on the graphic record. The wavelength was 95 meters from which is deduced that each cycle of the wavy line on a graphic record represents an altitude change of 155 feet. The barometric log gives altitude over the starting point whereas the radio echo log gives actual altitudes over the ground. The results should not necessarily be identical. The agreement of the general shape of these curves is quite convincing that we have in the radio echo a basis for absolute altitude measurement of height over ground.

"How this principle may be best applied for practical aërial navigation we are not yet able to say," reported Dr. Alexanderson. "Continuous graphic records may be used on larger craft and it may thereby be possible to positively identify the course flown with the maps and previous experience. Such graphic altitude logs may also be used for surveying. A very desirable development will undoubtedly be an instrument which permits of positive determination of altitude over the ground at any time desired."

The Gunn Altimeter

Baltimore *Evening Sun,* November 9.—An instrument to take much of the guesswork out of landing an airplane has now been perfected.

It is the Gunn altimeter, that measures instantly and accurately true altitude up to one hundred feet, and does it regardless of weather conditions or the speed at which a plane may be rising or descending. The inventor is Dr. Ross Gunn, a young physicist, who has been at work on the device for four years.

The altimeter tells the pilot when he is within one hundred feet of the ground by means of a dial, which indicates every foot of descent below this level.

The instrument becomes more sensitive the closer it approaches the earth, so that below fifteen feet, where a mistake in judging height is likely to smash a plane landing at speeds of forty miles an hour or more, it is possible to read the altitude to within a few inches.

The invisible measuring rod which this altimeter uses is the earth's electrical "capacity." Those who tune radios are familiar with "capacity" effects, whereby occasional squeals are heard, the tone of which varies with the position of the operator's hand when brought near the radio set.

In Dr. Gunn's instrument the flying airplane is the "hand" and the earth is the radio set, but instead of a squeal Gunn gets the altitude. Actually two "hands" are used in the ship, the plane itself being one and the other a wire or plate mounted on the under side. The closer the ship comes to the ground the greater the capacity between these two "hands." It remains only to indicate this change of capacity on an altimeter of some sort which can be calibrated in feet.

The problem has been made extraordinarily difficult by the fact that the changes at higher altitudes are extremely small, compared to inherent capacities on the plane.

It is just like putting a 150-pound man on the scales and trying to weigh accurately a penny which you hand him by noting the increase in his weight.

The change is so infinitesimal as compared to the high capacity of the hookup itself that for years the solution has generally been regarded as impossible. The entire apparatus in its present state weighs but twelve pounds.

Both the Army and the Navy have purchased one or more Gunn altimeters and their flyers have thoroughly tested them.

AVIATION

British Airship Engines

London *Times,* November 9.—Some account of the evolution of a new engine for airships burning crude oil at £5 a ton instead of inflammable petrol, and showing an economy in fuel of thirty per cent, over the existing petrol engines, was given last night to a joint session of the Royal Aëronautical Society and the Institution of Automobile Engineers meeting at the Royal Society of Arts.

The lecturer, Wing-Commander T. R. Cave-Browne-Cave, is an officer of the Air Ministry, who has been closely associated with the engine development for the new State airship of 5,000,000 cubic feet capacity, and he outlined how, starting with the well known solid fuel injection engine weighing about 100 pounds per horse-power, research and development had produced engines known as the Beardmore Tornado, weighing only 8 pounds per horse-power. The average petrol aëro-engine weighs about 2 pounds per horse-power, and the lecturer made the encouraging remark that there appeared no fundamental reason why the weight of the compression ignition engine should be as much as twice that of a petrol engine of the same power and equal refinement. Petrol had been the greatest fire-risk in airship operation and the paramount merit of the new engine was that the fuel had so high a flash point that it would not give off any inflammable vapor at all until heated to the temperature of boiling water.

The new engine was an eight-cylinder unit of 8¼-inch bore by 12-inch stroke, and it was originally hoped that it would develop 700 horse-power at 1,000 revolutions a minute. It was now to develop a continuous full power of 585 horse-power with a maximum of 650 horse-power, and the greatest difficulty met with in its development had been torsional resonance in the crankshaft. The eight cylinders arranged upright in line had the great advantage that the unit could be installed in a narrow engine car and good access to every part secured, but unfortun-

ately, owing to lack of knowledge now available, it was not possible at first to avoid a dangerous building up of resonance; and this had hampered development.

The consumption of the engine at its continuous full power was .385 pounds per brake horse-power hour. A saving of some thirty per cent as compared with a petrol engine was effected, and the consumption, unlike the petrol engine, improved slightly for a small decrease of power. Only one control, like the cut off of a steam engine, was necessary to vary the power output, and the general principle of operation was the injection of oil into each cylinder shortly before the top of the compression stroke, when the temperature and density of the air were sufficient to produce ignition and rapid burning.

An auxiliary petrol engine, the only source of power using petrol from special tanks isolated from the airship itself started the main engines in each of the five power cars, and required less than 10 horsepower to develop 100 to 120 revolutions per minute in the main engines for starting. The airscrews were of variable pitch, could be turned to neutral position where they gave no thrust with the engine running, and besides the forward thrust could be tuned to give an astern thrust for slowing the airship as she came up to the mooring tower.

An evaporative system of cooling had been developed, in which, as the water round the engine developed steam, this passed to a radiator at atmospheric pressure, was condensed and passed back to the cylinder blocks. The waste steam could be used as required for heating the passenger quarters. The auxiliary engines, in addition to starting the main units, also drove air compressors and electric generators for lighting and cooking and the cooling water for these engines was joined up with the main circulation; so that it could, if necessary, warm the big engines.

Special attention had been given to ease of repair, and each power unit complete with engine could be lowered from the ship while at the mast and another unit already tested hoisted into position. This scheme had the further advantage that, so soon as an improved type of engine was available, a power car could be developed to replace the present unit. Another feature was that the fuel stored in 224-gallon tanks could be pumped about the ship by compressed air to alter trim, and certain of the tanks had quick release valves which would jettison the full capacity in 11 seconds in an emergency.

The total capacity was twenty-nine tons, and this, Wing-Commander Cave-Brown-Cave stated, left a considerable margin above the twenty-two tons required to reach Egypt by the longest of the three selected routes in forty hours, at an air speed of seventy-six miles an hour against an average head wind of fifteen miles an hour. Experiments with the use of hydrogen, in addition to the air required to burn the oil, had proved very satisfactory, and in regard to gaseous fuel the author expressed the view that it was not likely to be used in R 101. It gave no advantage as compared with heavy oil used efficiently in a compression engine, and on the vitally important point of safety it appeared fairly certain that the fire risk was of the same order as that with the use of petrol.

In conclusion the lecturer stated that the only serious disadvantage of the heavy oil system was the weight of the engine, and that was likely to be reduced by the refinement of the present design and by the development of designs by other makers who realize the importance of using this safe and cheap fuel not only in airships, but in all future commercial ships.

Airplane Engine Ignition

Aviation. November 3.—Aviation ignition at the present time has reached a state of reliability that is highly gratifying, but the reliability is due to the duplication of equipment as well as to the perfection of that equipment. Perhaps no other factor is more vital to the continuous functioning of the engine than good ignition and there is no other subject of greater significance from a commercial as well as from an engineering point of view.

At present ignition design centers on reliability, but with reliability attained, may there not be some other factor to influence design a few years from now? With increased competition, considerations of cost may creep in. Then there is weight, fire hazard, safety and performance to consider. And behind the whole problem will be the question of basing the design on magneto construction or, with starters and generators becoming more common, on the battery

system as the fundamental ignition unit.

The discussion which follows is intended to bring out engineering fundamentals having a bearing on any kind of magneto or battery ignition system and is not intended as a specific reference to any particular make of ignition device. Where fundamental difficulties in any type of system are encountered it is always possible by superior design, materials or workmanship to neutralize their influence. Similarly with a design that is inherently ideal it is possible to sacrifice the natural advantages if the details of construction are slighted in any way.

With reliability to be considered first, the high tension magneto scores a point in being an independent system, needing nothing but wires to the spark plugs to make it work. The battery ignition, on the other hand, requires a battery, a switch with wires and connections for the primary circuit, in addition to its high tension circuits. And in case of corroded switch contacts or burnt switch fingers the result in the case of battery ignition would be to weaken or kill the spark, whereas with the magneto it would only prevent shutting off the engine.

The battery system also has an inherent weakness in depending on the storage battery as a source of primary current, for a short in the wiring might put the battery out of commission, in addition to creating a fire hazard, while the functioning of the ignition on the generator current would depend on maintaining the engine speed above the cut-in point of the generator—usually easy to do, but still an inherent weakness in the system.

From the standpoint of locating trouble on the plane the battery ignition system has the advantage, for the ammeter indication with the switch thrown right or left will show whether normal primary current is flowing, whether points make contact or not and, under certain conditions, will even show whether a condenser is shorted.

The magneto on the other hand cannot be readily tested without removing it from the engine. Inspection, however, will show whether the points are making and breaking. And inspection will show whether the distributor brush is in position or not and whether the distributor block is wet or shorted. With the magneto apparently timed correctly and no evident defect in distributor or interrupter it is desirable to try it with the primary wire to switch disconnected. Then if it does not fire it is usually found necessary to remove it for a test on the bench.

One advantage the battery ignition system always has is that it gives easy starting without auxiliary devices such as booster magnetos, required for easy starting with magneto ignition systems. The battery voltage is always ready to give full spark intensity, although at high speed the battery ignition spark tends to decrease in heat value, which is not true with magneto ignition.

The magneto spark, though weak at very low speeds, increases in strength up to a certain point and then tends to maintain a constant heat value, thus giving ideal ignition at all operating speeds. Nor is the need of the booster magneto a serious disadvantage at present, although it might become so at some future date when competition necessitates elimination of all but the absolutely essential equipment units.

Ease of starting, however, has its drawbacks, for there is also the case of having the engine kick back in case the engine is not timed just right or the kick back device is not functioning. Under these conditions the kick back might occur if the propeller is turned inadvertently. With the magneto, however, a slight movement of the propeller would not cause a spark, because of the low voltage generated with the magneto turning very slowly.

The question of cost has been mentioned before in connection with future planes sold at low prices. On such planes the matter of weight might also have to be considered more than on larger ones. This would dictate battery ignition, other things being equal and may lead engineers to do research along the lines of battery ignition development of great reliability.

As in the case of automobile ignition, where battery ignition followed the use of the electric starter and generator, there is likely to be a turning to battery units where cost and weight are dominant factors. The tendency to get simplification, to lower the costs of ignition equipment and yet retain the reliability of two separate systems is seen in the development of double magnetos which, with a single shaft, can affect the magnetic condition of two separate coils or windings and thus give two separate systems electrically.

Such construction duplicates the electrical units although giving a common mechanical link in shaft, bearings, gears, etc., the failure of which would put out of commission both of the electrical parts of the ignition system. Mechanical failures are of course, relatively rare as compared with point, coil, condenser and other electrical failures, so that such systems are better than single units, but not quite as good as entirely separate sources of ignition.

Maintenance costs may have to be considered at some time in the future, particularly on equipment used in commercial service. It is doubtful, however, if this angle of the question would influence the individual user of a plane to any appreciable extent. Platinum iridium points on magnetos cost more than tungsten points used in battery systems. Other parts are similar in cost, however.

Performance of magneto and battery systems has been discussed from the standpoint of ease of starting, reliability, testing and so on, but there is the possibility of spark voltage having some effect on future designs. The voltage required at the plug is affected by the gap, the points and the compression pressure.

As compression has increased in motor cars, the spark plug points have merely been set closer, so that ignition voltages have remained substantially unchanged. The same is true of airplane ignition, where the spark plug gap is set to suit the engine and the ignition device.

Even with superchargers it is doubtful if higher spark voltages will be needed or desired, for their use up to the present in airplanes has been chiefly to duplicate at high altitudes the compression pressures and engine efficiencies available at lower levels. And both magnetos and battery ignition systems have met all requirements of present day engines even when the compression has been relatively high.

MISCELLANEOUS

Strategic Naval Bases Throughout the World

Coast Artillery Journal, November. By Lieutenant W. H. Burns, C.A.C.—The function of a fleet is to control sea communications in the interest of its own nation and to the discomfiture of the enemy. For a fleet, naval bases correspond, in a way, to the jumping-off position from which an army makes an attack. Their installation during peace, in correct geographical positions, has an importance quite on a par with building the ships. Admiral H. F. Schofield, of the United States Navy, has said, "Ships without outlying bases are almost helpless—will be helpless unless they conquer bases."

The existence of great industrial centers, the movement of raw materials from other countries necessary for peace and war and of troops and supplies to any point which might be attacked, all depend on the maintenance of lines of communication. Their defense obviously relies on two factors: a navy to guard and the holding of positions from which that navy can most effectively carry out its work. Without such stations a navy would be as helpless as an army without a base, and it is also true that no holding of strategic points by land forces can maintain sea communications without an efficient fleet. It might be well to define clearly the functions which such stations can perform in time of war.

1. They are used for docking and repairs to capital ships and auxiliaries.
2. They form fuel and supply reserve depots.
3. They are submarine-proof shelters in which a fleet can rest and take in stores and where transports and supply ships colleft in safety to be conveyed to given points.
4. They are harbors of refuge and refueling stations for smaller craft with a limited radius of action.
5. They aid in the control of trade. By the ownership of the most fueling stations of the world, placed on the main routes of trade, shipping can be compelled to take certain pathways in time of war while the enemy can be stopped or forced to sail by circuitous routes.

The conditions, then, that make a naval base strategically valuable are its situation, its military strength, and its resources. Its position must be in the theater of operations, which, of course, is a gift of nature, and it should not be so far advanced that the lines of communication leading to it are flanked by strong enemy positions.

EXAMPLES:

Negative	*Affirmative*
Jamaica	St. Johns, N. F.
Trinidad	Halifax

It should, if possible, afford to the force occupying it the advantage of the use of interior lines. Example: Gibraltar against France. Positions in narrow seas or where sea routes converge are, generally speaking, more important than those in a great ocean because it is less possible to avoid them by circuitous routes. Examples: Panama, Gibraltar, Malta. Again the value of positions depends upon nearness to a vital sea route, either our own or the enemy's. In this connection the amount of trade that passes over this route enters into the question as well as the nearness of the base to this route. Examples: Hawaiian Islands, English Channel, Panama, Gibraltar, Malta, Suez Canal. If the position is at the cross-roads of two routes, its value is greatly enhanced. Examples: Cape Verde Islands, Constantinople.

Inasmuch as the United States, Great Britain, and Japan are conceded to be the three greatest maritime nations, this discussion will deal principally with the bases established and controlled by them. They are the only countries having important bases outside their continental limits and therefore I will merely enumerate some of the bases in the other countries and give their location.

Germany. As a result of the treaty of Versailles the German Navy amounts to practically nothing. There is therefore no need for naval bases in her case. Her most important bases during the war were at Kiel and Wilhelmshaven and these, in all likelihood, would be developed again in case they were needed.

France. Practically all the important ports of France are equipped for the repair and supply of naval vessels. Brest and Toulon are the largest.

Italy. As a general result of economy, all but a selected few of the bases in operation during the war are to be reduced to the basis of the minimum expense for maintenance and upkeep in those details affecting preparedness for war. This will leave the two naval bases at Taranto and Spezia, although there are a few others at which minor repairs can be made. There is also some discussion as to the necessity for establishing advanced bases in the Mediterranean, both Sicily and Sardinia being under discussion as possibilities.

Mexico. There are naval depots at Vera Cruz, Guaymas, Salina Cruz, and Payo Obispo, and a fueling station at Manzanillo, but the only drydock is at Vera Cruz. Vessels in the gulf have to go to the United States for docking.

England. Great Britain is well equipped with bases in the western Atlantic to strike at our vital coast area trade and for the protection of her lines and transport of troops overseas.

A general examination of the Atlantic shows us that there are four principal routes from Britain for operations against North America.

1. The direct route, straight for Halifax, then on to the United States.
2. A southern route, via the Azores, on to the West Indies, and then on to Jamaica and the Canal or to the Atlantic coast of the United States.
3. A sub-southern route, via the Madeiras, Trinidad, and on to the Canal.
4. A northern route, via Hudson Bay.

In considering an attack by Great Britain, the most strategic point from which she could initiate any movement would be from the port Berehaven, located at the extreme southwest corner of the Island. It is suitable for the assembly of a fleet. The route to Newfoundland is the shortest and this line continues on in practically a straight line to Halifax, Cape Cod, New York, Charleston, and Florida.

It can readily be seen, then, that one of the principal strategic features of the north Atlantic is the advanced position of Newfoundland, either as a point of approach from Europe, or as a point of jump-off or as a threat against Europe. Also, Newfoundland guards the mouth of the St. Lawrence, and this river is the key to Canada. An even more important base to obtain possession of would be that of Halifax. With these three bases, the two St. Johns and Halifax, in our control, any hostile force would be forced to go farther north and come down through the Hudson Bay region, and this route, while not impossible, has many disadvantages.

Let us consider the southern route across the Atlantic. The positions of Trinidad, Jamaica, and other islands of the West Indies permit of their use as possible bases in operations against us. The area between Trinidad and South America would provide an ideal fleet base—affording sufficient

room for unlimited anchorage and for exercises. This and Long Island Sound and Chesapeake Bay are what may be termed satisfactory bases in both area and position.

The harbors at Trinidad and at Jamaica in the British West Indies have a few resources, but little industrial development. There are many other anchorages and some small enclosed harbors scattered elsewhere all through the West Indies. Bermuda is defended and has a fairly large space for anchorage but no resources and very little industry, except a small navy yard. Halifax is undoubtedly best in all these requirements, including defenses and a harbor space which is ample for all needs. There are several anchorages in Newfoundland, St. Johns being by far the best one, where there is one large drydock.

The Falkland Islands guarding the route through the Magellan Straits would be an important position in the event of the Panama Canal being blocked. This base is rather distant for operation against the Atlantic coast or even against Panama but it is difficult to tell what eventualities may entail when once war starts.

Let us now travel eastward from the British Islands. Gibraltar is a fortified naval and fueling station and is the home of the British Atlantic fleet. Its position near the entrance to the Mediterranean makes it of great importance and increases its value as a rendezvous for the Atlantic and Mediterranean fleets.

Malta is placed almost midway between Gibraltar and Port Said and is nearly equidistant from Messina and Cape Bon. Its position therefore makes it a suitable station for commanding the approaches from the western to the eastern Mediterranean. The harbor of Valetta is well supplied with docks, is strongly fortified in its immediate neighborhood, and is the base of the Mediterranean fleet. Its central position in the Mediterranean makes it even more valuable from a naval standpoint than Gibraltar.

Aden is a fortified fueling station about one hundred miles northeast from the entrance to the Red Sea, and about halfway between Port Said and Bombay. It offers the opportunity for controlling the junction of the Indian routes where they converge before entering the Red Sea.

The naval base of Bombay possesses the largest and safest harbor in India and railways diverge from it in every direction. This brings all the resources of India within easy reach; but on the other hand it is rather a terminus of sea lines than a strategic point placed across them.

Port Said is located at the entrance to the Suez Canal which gives it a great value as it is at the entrance of a maritime gateway.

Some of the other British bases which complete the loop around the world are the Falkland Islands, Colombo in India, and Sydney, Australia.

A consideration of the naval problems of the Pacific cannot fail to include Singapore, the strategic center of the British Empire east of Suez. Singapore is the natural gateway through which must pass all the vast traffic on its way from Europe to China and Japan and upon which converge the great ocean routes connecting India with the Dutch East Indies, Australia, and the Far East. Singapore, therefore, is in an ideal position to safeguard trade with all these nations.

Japan. Let us now consider the islands composing the home territory of the Japanese Empire. The Inland Sea, which is the economic center of Japan, is a naval Gibraltar and constitutes an ideal naval base with few and easily defended outlets. The exits lead immediately to important strategic areas and are widely separated so that a blockading fleet would be tactically separated. Within the Inland Sea there is ample space for anchorage and maneuver. Also, surrounding the Inland Sea are important supply and repair facilities. Protecting the Inland Sea and its entrances is a circle of heavy fortifications.

Japan has three splendid bases in these home waters—Kure, Yokosula, and Sasebo. These are excellently equipped. Subordinate fleet bases for operations in the sea of Japan exist at Maizuru and Chinkai. There are torpedo bases at Ominato and Oshima in home waters and at Bako and Truk in outlying possessions. Bako and Truk can be used as fleet bases for short periods. In addition there are moderately good harbors in the Mandate Islands which can be used as destroyer and submarine bases. A few divisions of heavy ships could also be based in these harbors. Anami-O-Shima

has a fine harbor and could be made into a valuable fleet base. Some facilities exist at Port Arthur and Yeiko, Korea. Farther away there is an outlying circle of defense consisting of the Pescadores, Formosa, the Nansei Islands, and the Kurile Islands. Still farther out is a second line which encircles Guam and Manila—formed by Yap, the Carolines, Marshall Islands, and Bonin Islands. Only the Bonins are fortified.

There are many islands in the Pacific, controlled by the Japanese, which are very important strategically besides the Caroline and Marshall Islands. They extend from the Philippines 2,000 miles toward the Hawaiian Islands and are only 250 miles south of Guam. The nearest one to Oahu is Rongelab, 1,300 miles nearer Oahu than Guam is.

United States. Navy yards and naval stations in our country will be found at various places along the coast from Maine to Key West and from San Diego north to Bremerton, Wash. The largest on the east coast are those at New York and Norfolk. At Newport torpedoes are manufactured and tested and new developments are tried out. At New London is a base and training school for submarines, and at Pensacola a base and training school for aviation. Shipbuilding is carried out on a large scale at Brooklyn, Philadelphia, Norfolk, Newport News, and Mare Island, and on a small scale at Portsmouth, N.H. Long Island Sound, Chesapeake Bay, San Francisco, and Puget Sound are our best home bases.

In the vast expanse of the Pacific Ocean every problem of naval strategy is fundamentally a question of base facilities. Modern fighting ships have a narrow radius of action dimensioned by their relatively meager fuel capacity. From experience gained in the World War it is estimated that a battle fleet can remain at sea under war conditions not longer than four days. This means a cruising radius of two days.

The central or direct route and the most important course to the Philippines is the one via Oahu and Guam. The next most important route is the southern route via the Marshall and Caroline Islands, utilizing any of the various possible bases at Rongelab, Jalut, Iruk, etc. These are two practical routes. There are two others via Kiskra and Samoa which are improbable routes due to the unfavorable weather and because there are no areas for fleet bases.

The Hawaiian Islands are the best example we have of the installations required of a fleet base. Pearl harbor is designated as a main outlying base. It has practically all the facilities necessary for this kind of a base. Guam ranks only as a fuel station, though its position invests it with a unique strategic value.

Under present and expected conditions in the Pacific, San Francisco is the nearest real base to the Philippines. There are docks and shops at Pearl Harbor but no great protected harbor for a fleet. If the fleet mobilizes or bases there for a time, a large part of it will lie in open roadsteads where serious repairs cannot be undertaken.

Our only strategic base in the far East is at Manila but it is an extremely important base. There is a fine harbor at Manila which gives a place to establish a base for repairs and for a fresh take-off; it provides a terminus for our lines of communication from Oahu, from the Pacific coast, and also from Panama. In addition, it must be remembered that in case the Panama Canal should be blocked by slide or design, the Suez becomes a route to the far East and we would need a terminus in such a strategic position as Manila.

Our other bases in the Philippine Islands in addition to Manila, or in lieu of Manila, are really not bases, but are undeveloped harbors, safe anchorage spaces, such as Coron Bay, 150 miles south of Corregidor, and Malayampa Sound, 200 miles, both facing on the China Sea and both favorable as a base in a counterattack on Manila; Tawi Tawi, 500 miles south of Manila; also the Gulf of Davao, 650 miles southeast. Each one of these bases has its favorable characteristics, depending on the nature of the campaign or the relative strength and activity of the opponents.

In conclusion, it might be well to compare the three powers, England, Japan, and the United States. It is apparent that while the United States and Japan have bases from which to operate defensively, that neither has the facilities which are available to Great Britain for conducting operations away from home waters. Neither Japan nor the United States could carry on operations away from home waters without first capturing or establishing bases in the theater of operations, and obviously it is impossible for either to do this without going to war.

NOTES ON INTERNATIONAL AFFAIRS

From November 4 to December 3

Prepared by Professor Allan Westcott, U. S. Naval Academy

UNITED STATES AND EUROPE

President Advocates More Cruisers.—In an outspoken address in Washington on Armistice Day, President Coolidge strongly advocated completion of the cruiser building program of the Navy as required by "world standards of defense, eliminating all competition." He declared that, having few fueling stations, the United States needed warships of large tonnage, and "having scarcely any merchant vessels capable of mounting five and six-inch guns, it is obvious that, based on needs, we are entitled to a larger number of warships than a nation having those advantages."

Turning to our relations with Europe, he denied that the United States has made a profit out of the war, pointing out that our total expenditure would "run well toward a hundred billions," or half the total wealth of the country at the time. He said that the war costs of other countries would be reduced by territorial acquisitions and reparations, and that "our outlay would be much greater than that of any other country." He advised restriction of loans to Europe, especially since "we do not wish to finance preparation for future war." As for the Kellogg-Briand Peace Pact, his feeling was that it left matters of defense and armament "practically where they are," as the negative supports of peace. "So long as promises can be broken and treaties can be violated, we can have no positive assurances. . . . ."

The speech as it related to the naval issue and foreign loans was further summarized in the New York *Times* of November 12 as follows:

The President considered it significant that foreign Governments had agreed to limit classes of combat vessels in which the United States was superior at the time of the Washington conference on naval limitation, "but refused limitation in the class in which *they* were superior."

The fact that the Washington conference failed to limit the number of cruisers, lesser craft and submarines, which still can be constructed without limit by any nation, was stressed by the President, who said the United States "made altogether the heaviest sacrifice" in scrapping warships already begun. Since that conference, he said, the British have begun and completed seven cruisers, are building eight, and have five more authorized.

"When their present legislation is carried out," he continued, "they would have sixty-eight cruisers. When ours is carried out, we would have forty. It is obvious that, eliminating all competition, world standards of defense require us to have more cruisers."

No progress had been made toward naval limitation since the Geneva conference, the President said, and, in an allusion to the Anglo-French naval accord of last Summer, he added that "the movements" have been "discouraging."

From the naval issue the President turned to "recent developments," which, he thought, had brought the United States not only a new economic but a new political relationship to the rest of the world. Discussing "our duty to Europe," he asserted that while Europe had expressed "very definite ideas" on this subject, such duties were "not all on one side" but mutual.

The United States went to the rescue of Europe, "friend and foe alike," the President said, assisted in the temporary adjustment of reparations, and since 1924 the American people had lent $1,100,000,000 to national, state and municipal governments and to corporations in Germany.

While this money was not the entire source from which the $1,300,000,000 in reparations had been directly paid by Germany since that year, the President insisted that these American advances "must have been a large factor in rendering Germany able to pay."

Foreign Criticism.—It was inevitable that President Coolidge's Armistice Day speech should be sharply and even angrily criticised abroad, especially his views on our

war losses and on naval construction. It was considered illogical that he should expect European restriction of armament while recommending a larger American Navy. The London *Press* disputed his naval figures, and ironically remarked that the pressure of America's war burden was not visible to visitors here, nor the "imminent dangers" threatening our long coast-line and overseas commerce. The more radical papers went so far as to liken his naval claims to those of Germany before the war, the *Daily Herald* saying that, "despite all reassuring phases, all the elements of an Anglo-American conflict are present."

NAVAL POLICY.—Of especial interest, appearing as it did at the time of the President's Armistice Day speech, was the "Statement of Naval Policy," issued by the General Board of the Navy, approved by Secretary Wilbur, and published on November 12. This was largely a restatement of the similar document made out in 1922. The opening passages were as follows:

UNITED STATES NAVAL POLICY.

Naval policy is the system of principles, and the general terms of their application, governing the development, organization, maintenance, training and operation of a navy. It is based on and is designed to support national policies and national interests. It comprehends the questions of number, size, type and distribution of naval vessels and stations, the character and number of the personnel, and the character of peace and war operations.

FUNDAMENTAL NAVAL POLICY OF THE UNITED STATES.

The navy of the United States should be maintained in sufficient strength to support its policies and its commerce and to guard its continental and overseas possessions.

THE WASHINGTON TREATY LIMITING NAVAL ARMAMENT.

The Washington Treaty Limiting Naval Armament is the supreme law of the powers party to the treaty, governing their naval armaments as to capital ships, aircraft carriers and the size and armament of cruisers.

The spirit of the treaty indicates two elements of international import: A general desire to avoid competition in naval armament and a partial recognition of a ratio in naval strength as a means of avoiding competition.

Should any power undertake a program of expansion in unrestricted classes of naval vessels, or in personnel, not consistent with the treaty ratios of capital ships, a new competition in naval strength would thereby be initiated.

Until such time as other powers by inequitable conduct in international relations as to United States interests, or, by their departure from the idea of a suspended competition in naval armaments, indicate other procedure, the navy of the United States may be governed in naval strength by the spirit of the capital ship ratios; otherwise it will be necessary appropriately to readjust our naval policy.

GENERAL NAVAL POLICY.

To create, maintain and operate a navy second to none; and in conformity with the ratios for capital ships established by the Washington Treaty Limiting Naval Armament.

To make war efficiency the object of all training and to maintain that efficiency during the entire period of peace.

To develop and to organize the navy for operations in any part of either ocean.

To make strength of the navy for battle of primary importance.

To make strength of the navy for exercising ocean-wide control of the sea, with particular reference to the protection of American interests and overseas and coastwise commerce, next in importance.

To encourage and endeavor to lead in the development of the art and material of naval warfare.

To give every possible encouragement to civil aviation with a view to advancing the art, and to providing aviators and aircraft production facilities available for war.

To cultivate friendly and sympathetic relations with the world by foreign cruises.

To support in every possible way American interests, especially in the expansion and development of American foreign commerce and American merchant marine.

To maintain a Marine Corps of such strength that it will be able adequately to support the navy by furnishing detachments to vessels of the fleet in full commission, guards for shore stations, garrisons for outlying positions, and by the maintenance in readiness of an expeditionary force.

To coöperate fully and loyally with all departments of the Government.

This was followed by a formulation of building and maintenance policy in regard to capital ships and other types, organization and operative policies, and concise statements of policies in other branches of naval activity.

BRITTEN PROPOSAL FOR NAVAL CONFERENCE.—Late in November Representative Fred A. Britten, senior Republican member of the House Naval Committee, wrote a letter directly to Premier Baldwin of Great Britain proposing a conference, perhaps in Canada, between members of the Naval Committee of the U. S. House of Representatives and delegates of the British House of Commons, to reach an agreement on limitation of naval armament. Mr. Brit-

ten's action was regarded with some annoyance by the President and the State Department, as an incursion upon their domain in the conduct of foreign affairs, and possibly even as a violation of the Logan Act which forbids correspondence with a foreign power on the part of an American citizen with a view to influencing foreign policy. Premier Baldwin's reply was given by the British Ambassador in Washington to Secretary Kellogg, who declined to transmit it to Mr. Britten.

WORLD COURT QUERIES RENEWED.—At a breakfast to Republican senators on November 24, President Coolidge expressed hope for favorable Congressional action during the short session on both the Kellogg Peace Treaty and the Cruiser Bill, and also forestalled discussion of the World Court issue in Congress by stating his intention to renew inquiries to foreign powers regarding the Senate reservations. There seemed to be no thought in the mind of the President or the senators that the reservations themselves should be modified, and in view of the President's statement, there appeared no likelihood that Senator Gillett's resolution for reconsideration would be taken up during the short session.

It will be recalled that the only objection made to the reservations on the part of foreign powers applied to the fifth reservation forbidding the court, without American consent, to entertain a request for an advisory opinion on "any question wherein the United States has or claims to have an interest." Foreign comment regarded any change of position on this point as unlikely.

KELLOGG PACT AND CRUISER BILL.—Prospects for ratification of the Kellogg-Briand Peace Treaty by the Senate during the short session, as urged by President Coolidge, appeared brighter when Senator Swanson, ranking Democratic member of the Foreign Affairs Committee, declared his support of the agreement. Possible difficulties, however, are likely to arise in relation to the effect of the pact in restricting our enforcement of the Monroe Doctrine, and also in view of the argument that acceptance of it may involve recognition of Soviet Russia, another adherent to the agreement.

THE MONROE DOCTRINE AND THE LEAGUE.—In the *Bulletin of International Affairs,* published fortnightly in London by the "Information Service on International Affairs," the leading article in the October 27 issue is a valuable and very clear account of the Monroe Doctrine in its relations and possible conflicts with the League of Nations. After tracing the origin of the doctrine and its later extension to include "international police measures" and application to all "non-American nations," the article recalls that President Wilson, in his efforts to secure the entry of the United States into the League, proposed an amendment to the Covenant which ultimately became Article 21, as follows:

> Nothing in this covenant shall be deemed to affect the legality of international engagements such as treaties of arbitration and regional understandings like the Monroe Doctrine, for securing the maintenance of peace.

This was adopted after much opposition from France, who feared it would weaken Article 10. As a matter of fact, in actual practice the Monroe Doctrine practically excludes not only European powers individually but the League itself from any active part in settling disputes among American nations. This has been noted by Latin American members of the League, who, none too enthusiastic over the Doctrine themselves, and insisting that it is a unilateral policy of the United States, have sought to elicit from the League Council a statement of what the League takes it to mean. The question was first put definitely last summer, when Costa Rica, on being asked to reconsider her withdrawal from the League, replied on July 18 that she was willing to reconsider if the Council would define:

> . . . . the interpretation placed by the League of Nations on the Monroe Doctrine, and the scope given to that Doctrine when it was included in Article 21 of the covenant of the League. . . . . It cannot be argued as a reason for refusing this definition, as stated in Article 21 mentioned above, this Doctrine is a regional understanding, since the inclusion of various American nations in the League, and the fact that this Doctrine is mentioned in the Statute by which it was created fully justify its definition by the League. It may be pointed out that the Doctrine in question constitutes a unilateral declaration.

The reply of the League to this troublesome query is described in the article as follows:

> The Council considered the Costa Rica Note at its August Session. While it was felt that the

request for a definition had been inspired by the Argentine Republic, ever the most militant of the South American States towards the United States, there was every evidence that the State Department in Washington was watching with mingled interest and amusement the predicament in which the tiny Central American Republic had placed the League of Nations. Between the Scylla of not wishing to scare away the Argentine, which had just begun to resume coöperation with the League, and the Charybdis of giving offense to the United States at a moment when it was hoped that the signing of the Pact of Paris might bring her back into world politics, the Council was placed in a very delicate position. It took three secret sessions to evolve an adequate formula of reply, but when that formula was given to the world on September 1 it was seen to be a document at once effective and adroit.

The Council's reply made no attempt at a definitive elucidation of the relation between the Monroe Doctrine and the Covenant. It stated that Article 20 stipulated that "Members of the League severally agree that this Covenant is accepted as abrogating all obligations or understandings *inter se* which are inconsistent with the terms thereof . . . . " and recalled that Article 21 had originally been proposed as an additional paragraph to Article 20. In declaring that the engagements mentioned in the former Article were not deemed incompatible with any of the provisions of the Covenant, the Article refers only to the relations of the Covenant with such engagements; it neither weakened nor limited any of the safeguards provided in the Covenant. The Note then proceeded:

"In regard to the scope of the engagements to which the Article relates, it is clear that it cannot have the effect of giving them a sanction or validity which they did not previously possess. It confines itself to referring to these engagements, such as they may exist, without attempting to define them: an attempt at definition being, in fact, liable to have the effect of restricting or enlarging their sphere of application. Such a task was not one for the authors of the Covenant: it only concerns the States having accepted *inter se* engagements of this kind."

Thus the Council of the League diplomatically parried a very skillful thrust, and it is of interest to note that in the whole of the Note to Costa Rica, a document of some 700 words, the Monroe Doctrine is not once mentioned specifically by name.

It is difficult to see just how such a situation can end. The Latin American States will undoubtedly return to the charge at a later date, and it would be impossible for the League of Nations to consent to any proposal which envisaged the deletion of the Monroe Doctrine from the Covenant. The Covenant must stand unamended, at least as far as that Article is concerned. It is merely one of the many anachronisms which would never have arisen if, when the Covenant was framed, it had been foreseen that the United States of America would not play the great rôle which was expected of her. It can only be hoped that the adherence of all the Latin American States to the Pact of Paris, in addition to the resolution outlawing aggression adopted at the Havana Conference, may give these States a sufficient feeling of security against a possible domination from the North: though it must be noted that the majority of those States which have not replied to Mr. Kellogg's invitation to adhere to the Peace Pact are among the Latin American countries.

GERMAN DEBT NEGOTIATIONS

ARRANGEMENTS FOR EXPERT COMMITTEE. —During November Germany and her creditor nations made some progress in negotiations over the composition and selection of the Committee of Experts which is to attempt to fix finally the amount and manner of payment of the German debt. Agreement was reached that the delegates should be financial experts rather than government officials; that American delegates, acting as private individuals but with the sanction of the American government, should be invited to serve; that the committee should be appointed and begin work as soon as possible; and that the Reparations Commission should issue the formal invitations to the prospective members, though actually they would be selected by their governments. In regard to the personnel of the committee, Mr. Owen D. Young was most prominently mentioned as an American member. France on November 22 announced the selection of Emile Moreau, president of the Bank of France, and Professor O. Allix, of the faculty of political economy of the University of Paris. The other members will probably be Emile Francqui, former Finance Minister, for Belgium; Sir Josiah Stamp, economist and statistician, for England; Dr. Schacht, president of the Reichsbank, for Germany; and Signor Pirelli, already appointed, for Italy.

Beyond the statement that France and England will ask no more than enough to pay their debts to America and property damages, there has been little effort as yet to reconcile German offers and Allied demands, but it has been suggested that the result will be a compromise on payments slightly under $500,000,000 a year.

FRANCE

FRANCO - ITALIAN NEGOTIATIONS. — Reports appeared in early November of continued negotiations at Rome for an agreement on pending issues between France and Italy, especially in relation to the Mediterranean and northern Africa. France, it is said, will insist that Italians born in Tunis

shall be regarded as of French nationality, and if Italy makes concessions on this point she may obtain further advantages on the boundaries of Tripoli, and a favorable attitude toward an Italian mandate in the eastern Mediterranean, in territory now controlled by England and France.

POINCARÉ MINISTRY REORGANIZED.—Owing to opposition, especially to the government financial program, expressed by the French Radical Socialists in their party congress at Angers, Premier Poincaré's "Cabinet of National Union" submitted their resignations on November 4, and the French political situation was in temporary turmoil. It was generally recognized, however, that a reorganized cabinet under Mr. Poincaré was the only one offering any promise of enduring strength. To this M. Poincaré finally consented, and on November 12 announced a cabinet in which the former Socialist members were dropped and which became thus more strongly dominated by Nationalist elements. As indicated by the vote of confidence of 330 to 129, the new government still commands a sufficient majority in the chamber. In the reorganized cabinet, M. Poincaré turned over the Ministry of Finance, formerly held by himself, to Senator Henri Cheron, a trusted and able worker, leaving the Premier freer for general direction of policy and activity in the prospective negotiations over reparations.

BALKAN STATES

PEASANT CONTROL IN ROUMANIA.—Apparently in fear for the safety of the crown in view of the growing strength of the Peasant Party in Roumania and its intense hostility toward the long-standing domination of the Bratiano family, the Regency on November 2 demanded the resignation of Premier Vintilla Bratiano and his Cabinet, to take effect before December 1. The Ministry resigned on the following day. The Peasant party refused to join in a coalition cabinet, and on November 10, organized a ministry of their own, with their leader Juliu Mariu as Premier. Premier Mariu is a Transylvanian lawyer, a practical and able leader who first came into prominence by his fusion of the Transylvanian Nationalists with the Roumanian Peasant Party several years ago. On assuming the premiership he pledged loyalty to the present monarchy and regency, and opposition to the return of Carol, and declared that his country would now be governed by the people through parliament and not by a political clique.

Thus after fifty years of control by the landed interests, Roumania with its predominantly Agriarian population of 16,000,000 has come under popular rule. Premier Mariu, however, will have problems to solve, for the state is bankrupt, and negotiations between the Bratiano Cabinet and foreign financiers for a loan of $250,000,000 were broken off with the change of government.

CONCESSIONS TO CROATS IN JUGOSLAVIA.—As an outcome of the withdrawal from Parliament of Croatian and other deputies from western Jugoslavia, after the shooting of their leaders last summer, the Jugoslav Ministry offered on November 12 to grant wide concessions in the direction of self-government to Croatia, Dalmatia, and other provinces joined to Serbia after the war. General elections were promised as soon as an agreement was reached with the Croatian leaders. The only conditions attached to the concessions were that the decentralization should not be incompatible with national unity or with the will of the people as expressed in the proposed election.

TERRORISM IN BULGARIA.—Serious disturbances threatened in Bulgaria when General Michailoff, a Macedonian comitatje leader, rejected a government ultimatum to disperse his armed forces, and threatened to march on the capital and put to death selected members of the government. The activities of the comitatje are fundamentally based on the idea of bringing under Bulgarian rule large numbers of Macedonians now in territory controlled by Jugoslavia and Greece. Recently, however, they have broken into two factions and engaged in hostilities among themselves. The government has little power to quell disturbances, since a large part of the army and some members of the ministry are in sympathy with the comitatje aims.

UNITED STATES AND LATIN AMERICA

LIBERAL VICTORY IN NICARAGUA.—The presidential election in Nicaragua on No-

vember 4 resulted as expected in a victory for the Liberal candidate, General Jose Maria Moncada, by a majority of 19,500 in a total vote of 132,500. The elections were orderly and fairly conducted, and no resentment appears to have been aroused by American supervision. To prevent repeating of votes, each voter was required to stain his finger in a chemical solution upon casting his ballot. The parliamentary elections were very close, resulting in a tie in the Senate with twelve votes for each party, and in the Chamber, 23 Conservatives to 20 Liberals. The inauguration of President Moncada was set for January 1. The era of comparative good feeling apparently dawning in Nicaragua was evidenced by the presence of both Liberal and Conservative leaders in welcoming President-elect Hoover on his visit in November.

NICARAGUA FINANCE PROPOSALS.—The report of Dr. W. W. Cumberland, American financial expert, based upon his survey began a year ago of economic and financial conditions in Nicaragua, was made public by the U. S. Department of State on November 19. The report assumed that training of the National Guard by American Marines would continue, and recommended the appointment of Americans to strategic positions for control of Nicaragua's finances. It suggested that the Customs Service, now under an American collector general, should take over the collection of internal revenue as well; that an Auditor General, also to be an American, nominated by the U. S. Secretary of State, should be created; and that a High Commission consisting of these officers and the Finance Minister should be entrusted with framing the budget and should have veto power over revenue and currency legislation. The Bank of Nicaragua, as fiscal agent, should have only a minority of Nicaraguans on its board of directors. On the basis of this arrangement, Dr. Cumberland advised a total government loan of $30,000,000, of which $12,000,000 should be borrowed at once, to be expended in highway construction and other public improvements including a railway to the East Coast. The present debt is calculated to be $5,675,000 of which over $3,000,000 is owed abroad. The total American investments in Nicaragua, public and private, are only about $10,000,000.

The American State Department indicated that Dr. Cumberland's proposals were purely personal, and not approved by the United States Government, and that not all of his suggestions were possible. President Coolidge expressed opposition to the idea that the United States should undertake to supervise in any way the immediate $12,000,000 loan.

MR. HOOVER'S SOUTH AMERICAN TOUR.—Immediately following the election, and after consultation with government leaders in Washington, President-elect Hoover decided on a series of friendly visits to countries of Central and South America. The general plan of the tour was to go down the Pacific coast in the battleship *Maryland*, visiting Honduras (November 25), Salvador, Nicaragua, Costa Rica, Ecuador, Peru, and Chile (December 7), and then to cross the Andes and stop briefly in Argentina, Uruguay, Brazil, and Venezuela on the East Coast. While the journey was largely a pleasure trip, Mr. Hoover never having visited South America before, it was intended also to strengthen our friendly relations with Latin America and to promote American trade. With Mr. Hoover's intimate knowledge of Africa, Australia, and the Far East, as well as more recently of Europe, it was noted that after his South American tour he would have a grasp of political and economic conditions on practically a world scale.

MEXICAN PRESIDENT INAUGURATED.—Emilio Portes Gil, elected Provisional President by the Mexican Parliament after the assassination of President-elect Obregon, took the oath of office on November 30. He will serve for fourteen months, pending another popular election. President Portes Gil expressed his intention to continue the economic and foreign policies of Obregon and Calles, and retained three members of the Calles Cabinet.

FAR EAST

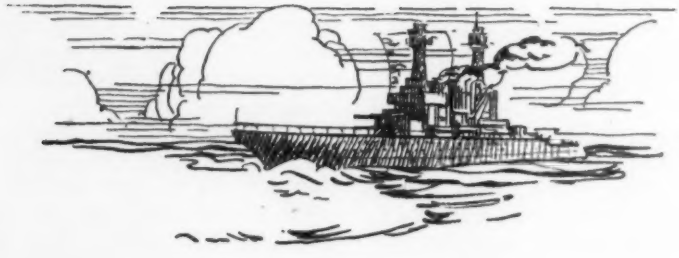
JAPANESE EMPEROR ENTHRONED.—Nearly two years after his father's death (December 26, 1926), Emperor Hirohito of Japan, 123d ruler in direct line, was enthroned at Kyoto on November 10 in a series of elaborate and beautiful ceremonies, dating back in some instances more than 2,000

years. Delegates of twenty-six nations were present, fourteen of whom were from republics, and only one, the representative of India, from an empire. The ceremonies were not completed until Hirohito and the Empress returned on November 30 from Kyoto to the Chyoda palace in Tokyo.

CHINO-JAPANESE NEGOTIATIONS HALTED.—At the close of November it appeared clear that negotiations between Chinese and Japanese representatives at Nanking had definitely broken down, chiefly owing to the Nationalist demand for immediate evacuation of Shantung by the Japanese, as a condition to further discussions. Even were Japan inclined to consider such a concession, it would hardly seem justified and certainly not necessary, in view of the constant menace of renewed factional warfare among the leaders of the Nationalist régime.

ANGLO-JAPANESE UNDERSTANDING.—While it is absurd to speak of anything like a renewal of the old Anglo-Japanese Alliance, especially in view of the feelings of the British dominions, there appears some basis for press reports that the two countries are ready to work together in their dealings with China. On his recent visit to London, it is stated, Count Uchida proposed that Japan and Britain should return to the policy agreed upon by the nine powers at the Washington Conference, i.e., that the powers should act together and enter into no separate treaties with China for special rights or privileges. This agreement they regarded as modified in practice, presumably by the steps taken by the United States in recognizing China and promising tariff autonomy.

DR. WU AMERICAN ENVOY.—It was announced on November 29 that Dr. C. C. Wu, former Nationalist Foreign Minister, would succeed Alfred Sze as Minister to the United States, the latter having been made Minister to Great Britain. It was also announced at Nanking that agreement would soon be reached for raising the American legation in China and the Chinese legation in Washington to the rank of embassies.



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WITHIN THE WALLS OF NANKING. By Alice Tisdale Hobart. New York. MacMillan and Company. 1928. $2.25.

REVIEWED BY CAPTAIN H. A. BALDRIDGE, U. S. NAVY

"Pray, Shanon. Pray God to save you."

"I have, mother," came in trembling words and muffled voice from the little girl huddled on the floor.

"Pray some more."

What sublime faith! And in adult and child alike! With Death and his two accomplices, Rape and Mutilation, stalking just outside.

In a far corner of the room on bended knees were six men—they too were praying God's mercy to spare the beleaguered souls from a fate worse than death.

The long, long hours of terror were nearing their end; what end none knew.

Above the sound of the prayers within could be heard the maddened and infuriated cries of the Chinese Nationalist soldiers without, mingled with the crack of their rifles as the bullets winged their way inside, whistling and singing over bowed heads and prone bodies.

Fifty-two Americans and Britons, men, women and children were trapped that grim, cold winter's day, high up on Socony Hill, overlooking the city and walls of Nanking.

In the southward portion of the city and within the walls there had been, earlier in the day, 120 other foreign souls of all ages and sexes—*had been*, for none knew at this time how many still lived, for communications were all but cut off.

In the distance, to the westward and beyond the walls and marshes, their decks and guns cleared for action, could be seen the warships of America, Great Britain, and Japan, fretfully tugging at their anchors as they rode to the swift currents of the yellow muddy waters of the Yangtse. Their officers and men were also praying—praying for the signal that seemingly would never come from the roof of the house on Socony Hill. Was it too late? Had all the occupants been massacred.

Still further to the westward the saffron afternoon sun was struggling to hide his face as if ashamed of the yellow fiends on this fateful March 24, 1927. What a coincidence—the sun, the river, the demons—all the same color!

Suddenly a signal boy from the U.S.S. *Noa*, who had been stationed ashore in the house for just such an emergency, was seen mounting the roof, and amidst the sniper's bullets, sent the following message to the waiting ships in the river below:

COMMENCE FIRING, FIRE OVER OUR HEADS, SOS SOS

It is a pleasure for the reviewer to call attention to Mrs. Hobart's last book, *Within the Walls of Nanking*, for he had occasion to refer to her first book, *By the City of the Long Sand*, in Secretary's Notes in the May, 1927, number of the PROCEEDINGS, and subsequently he had the added pleasure and honor of meeting her and Mr. Hobart upon their return to the United States in the summer of 1927.

Alice Tisdale Hobart, wife of a representative of one of our big American oil companies in China, went to the Far East as a young bride nearly fifteen years ago (I feel sure she will pardon my reference to statistics, but I want to emphasize the point that she was no overnight steamship visitor touring the Far East and then writing a book all about China. I will say that she was a very *young* bride—at least that sounds better and is more polite). She first made her "home" in North China at one of the pioneer oil stations established by the company near the Manchurian border. Save for their occasional vacations to the States, she accompanied her husband for thirteen years, from the north to the south of China and

far up the Yangtse Valley as he gradually rose to more responsible positions in his company's service.

Mrs. Hobart is therefore well qualified by travel and experience to know her subject. Not only this; she is a trained observer, has gained a place for herself in literature, and has done so by new methods. In her first book she told us of her many "homes" and servants—she made us see China through a woman's eyes. In addition to being an unusually shrewd observer and an entertaining writer, she has that sometimes unerring woman's intuition that so often confounds the opposite sex.

In *The City by the Long Sand* one can sense the gradual changes which were taking place all over China—changes which were made evident in the home life, in the attitude and behavior of the Chinese servants, and in the life of the community. We of the Navy know what wonderful servants these Chinese were a decade or so ago; how friendly, loyal, and efficient. There is just a suspicion that the author sensed these vital changes long before they were apparent to others in political and diplomatic posts. She read their true meaning—possibly woman's intuition—who can say?

To the traveler, the naval and army officers and their families, the diplomatic and consular services, her first book is and has proved interesting.

This, her second volume, takes up her experiences where they left off in the first book, namely at Changsha, in the very heart of China. *Within the Walls of Nanking* begins with her and Mr. Hobart's return from a short visit to Shanghai in June, 1926, to the troubled city at the head of Tung Ting Lake. Her description of the flood is splendid and must be read to be appreciated. No reviewer can do it justice. Then she tells the story of the Nationalist uprising in the south, of the army's march toward the province of Hunan, of their own forced departure from Changsha and down the river to Nanking. It is all there and from personal experiences—the successive crumblings of law and order and of cities and villages—Wuchang, Hankow, Kiukiang, Wuhu, all the river ports; the fall of Shanghai; and lastly that tragic ending at Nanking.

The book is of 243 pages, including Appendix I, "A Statement to Chinese Friends By a Group of Nanking Missionaries," and Appendix II, "Quotation from New York *Times* of January 23, 1928, of a portion of an article by Henry F. Misselwitz, special correspondent."

The "book is dedicated to the men, women, and children of all nations beleaguered in Nanking, March 24, 1927, especially to my friend, Consul John Ker Davis and my husband, Earle Tisdale Hobart, and the four signalmen from the U.S.S. *Noa* and U.S.S. *William B. Preston,* who bore the brunt of the attack at my home on Socony Hill when fifty-two Americans and Britons were imprisoned."

In the final escape under fire to the warships in the river, her husband, one of the last few to be lowered over the sixty-foot wall, was badly injured as a result of a fall when the rope, hurriedly made from "sheets, blankets, curtains, knotted together" carried away. He sustained a broken ankle from which he will never fully recover.

The story of the events at Nanking has been interestingly and ably told by the commanding officer of the U.S.S. *Noa,* Lieutenant Commander Roy C. Smith, Jr., U. S. Navy, in the January, 1928, number of the PROCEEDINGS. It has been told many times in various newspapers and magazines. This new version is full of human interest, and Mrs. Hobart is at her best. How well she has done it! One recalls Putnam Weale's *Indiscreet Letters From Peking.* One feels as if actually seeing a moving picture of these stirring events.

The proem by Florence Ayscough is scholarly and exceedingly well written and is well worth the time of any one interested in the causes which have led to the present upheaval in China. There have been so many experts in recent years who have been telling us what is the matter with that ill-fated nation that it is with something of the same relief for the reviewer to read her foreword as it was years ago when he first read William Allen White's *What's the Matter with Kansas?*—not that there is any similarity between the two styles of writing.

When at last the *Noa* opened the barrage with a two-gun salvo the cord of tension snapped in that house on the hill. Let the author describe it:

> The heavens and earth seemed split apart with a deafening crash right below us, almost in the room. And then the whole house seemed to go mad. Each according to his faith gave thanks.

Some were shouting "Thank God," and some were swearing.

Another deafening roar! The house trembled with the concussion. I did not care if the shells hit the house. I felt absolute joy and no fear whatsoever. To go like that, go out clean, blown into atoms by a shell after hours of facing such horrible unclean deaths! After hours when I was sure they'd murder our men and they'd be left behind to be mutilated in death! Oh, no! I did not care if our shells blew us to bits! No! Let them blow us to bits altogether there in the house —my husband and I going to a clean death! Oh, God! The shells! Let them come! More of them! More of them! Let them blow us to bits! The shells! I was mad with relief from the thought of that clean death.

In the house was a guard and three signal boys from the American men-of-war in the river. Earlier in the day before the other refugees from the American and British consulates arrived, the naval guard under the chief boatswain's mate had been ordered by Mr. Hobart to hide their arms in the attic so that the looting soldiers would not see them when they came to the house else the latter would use this as an excuse to kill the entire party. The chief petty officer reluctantly did as ordered.

"I have had sailors in my home more than once in China," writes Mrs. Hobart, "and anyone of them at any time would cheerfully risk his life to perform his duty, but this thing that was now asked of him he considered too thick; namely, to actually throw down his arms in the face of an armed antagonist. A look of opposition passed over the faces of those sailors." After the men came down stairs, the author says, "I never saw such an expression on the face of a group of men. Those rifles were a part of their wardrobe. I really believe they felt immodest without them. No one said very much as we all sat down trying to look natural. 'We are not to look like sailors. Just a lot of men sitting around for our health.'" The men then sat on the floor and played poker. Mrs. Hobart says, "I went upstairs then, thinking the men would have a better time if the one woman in the house was not around. They were always so beautifully careful of their language when I was there, and I felt they deserved a little freedom of language after disarming."

Later in the day the refugees from the American and British consulates arrived on Socony Hill, "wet with perspiration, panting for breath" and the author remembers one of the sailors saying, "Give this little girl a drink," referring to Shanon Davis, the consul's little daughter; and later another one said, "Give this little tike a drink, too," meaning the consul's little son.

How different when the time came to use their arms!

"I saw the sailors," writes the author, "at the window smashing the glass and the window frames with their bayonets, and joyfully, steadily, taking aim at the snipers below. They were almost crying with joy after the hours when they were allowed to do nothing but protect us. I never heard such swearing, but it was good swearing. I'd declare before God it was good swearing.

"'You blankety blank blank. You yellow dog—killin' women and children. Take that and that.'"

Mrs. Hobart concludes her story:

But there is one more picture which I shall never forget. The Nationalists within the walls of old historic Nanking, making carnival over the going of the foreigner. In and out of the houses of these people they go, despoiling them, carrying off tables and chairs, chopping up pianos for firewood, tearing up books, throwing them about the gardens, killing house pets, wearing the owner's garments, selling them in the market-place. Upon its promontory I can see my own house standing, empty and silent, stripped even of its window frames, a bleak reminder of the tragedy of the going from Nanking of the representatives of friendly states.

If one would know how it feels to be penned up in a house with family, friends and children, at the mercy of an uncontrolled army which is thirsting for blood—and having just tasted it—then read Mrs. Hobart's new book.

PROBABILITY AND ITS ENGINEERING USES. By Thornton C. Fry, Member Technical Staff, Bell Telephone Laboratories, Inc. New York: D. Van Nostrand Co., 1928. $7.50.

REVIEWED BY J. B. SCARBOROUGH

This book is the latest and most extensive work on mathematical probability in the English language. It is written in an easy, conversational style and is interesting reading nearly all the way through, except possibly for one or two chapters. The treatment is clear and scholarly throughout. The work of Dr. Fry in applying probability to telephone problems has qualified him uniquely for writing just such a book.

Some idea of the scope and character of the book may be obtained from a glance at

the headings of its eleven chapters: I, Introduction; II, Permutations and Combinations; III, Elementary Principles of the Theory of Probability; IV, Probability and Experiment; Bernoulli's Theorem; V, Probability and Experiment; Bayes' Theorem; VI, Distribution Functions and Continuous Variables; VII, Averages; VIII, The Distribution Functions Most Frequently Used in Engineering; IX, Curve Fitting; X, The Theory of Probability as Applied to Problems in Congestion; XI, Fluctuation Phenomena in Physics.

There are also eleven appendices, consisting mostly of numerical tables. These tables give the factorials of the first 200 integers; the logarithms of the factorials of the first 1,200 integers; the binomial coefficients C_n^m up to $m = 100$ and $n = 50$; the normal error function, its integral, and first six derivatives; the Poisson formula; Pearson's Criterion of goodness of fit; etc. Appendix XI is a sort of compendium of the whole subject of fitting curves to statistical data.

In the first chapter the author gives an interesting discussion of the meaning of probability—what it is "all about." He defines the terms used, states the axioms, and tells how probability is measured. The next two chapters are clear and well done.

The purpose of Chapter IV is to explain why experiment can be used as a practical means for the approximate evaluation of probabilities. The why is contained in Bernoulli's theorem, which means in everyday language that if conditions remain unchanged and the number of trials is large we may judge the future by the past. Chapter V points out some of the fallacies of probability and discusses the influence of experience on probabilities.

Chapter VI, as its title indicates, is largely mathematics—mostly Jacobians—with an application to Maxwell's equation in the kinetic theory of gases.

In Chapter VII such terms as expectation, median, deviation, etc., are defined and explained. The general cases of dependent and of independent trials are worked out. The famous St. Petersburg Paradox is discussed at length and a new interpretation of the answer is given.

Chapter VIII deals mainly with the normal probability law, the Poisson law, Pearson's curves, and the Gram-Charlier series. Many of the problems of industry and everyday life are shown to conform to the Poisson law.

The chapter on curve fitting deals with fitting curves to statistical data, not ordinary engineering data. The problem of Weldon's dice data is discussed at length.

The longest chapter in the book, and probably the least interesting for most readers, is Chapter X. It deals with problems of traffic congestion in automatic telephone exchanges. Its chief interest to the reviewer was in showing to what extent the theory of probability has been applied to a complex industrial problem.

The last chapter is of interest mainly to physicists. It deals with the application of the theory of probability to the kinetic theory of gases and radio amplifiers.

Two valuable characteristics of this book must now be mentioned. The first is the *résumé* appearing in nearly every chapter, in which the main results of preceding pages are restated in concise language, with closely related concepts appearing side by side in parallel columns. These *résumés* enable the reader to see at a glance just what has been proved.

The second important characteristic is the large number of illustrative problems worked out in the text. These for the most part are worked in detail, all the whys and wherefores given, and the results discussed as far as may be worth while. Many of these problems deal with tossing coins, throwing dice, drawing balls from an urn, etc., but many also deal with other things. The following is of a type not found in other books on probability:

> A retail chain store, with limited storage facilities, sells on the average ten boxes of dog biscuit per week. The usual practice is to stock up on Monday morning. How many packages should be adopted as the standard Monday morning stock in order not to lose more than one sale out of a hundred?

The answer turns out to be sixteen.

Just here a word may be said about the title of the book. The word "Engineering" in the title must be interpreted in its broadest sense. Most of the practical applications mentioned in the book belong to the fields of industrial and efficiency engineering. Perhaps a more fitting title would have been "Probability and Its Applications to Industry and Every-Day Affairs."

Since naval officers will constitute the

majority of the readers of this review, it is quite natural to ask wherein mathematical probability, as set forth in this book, can be applied to affairs of the Navy. The reviewer is not familiar enough with naval problems to give a definite answer to this question, but it would seem that there must be many where the principles of probability can be applied for the good of the service. The officer who is acquainted with naval problems and also with the contents of this book would doubtless see many opportunities for the application of probability. For this reason a copy of the book should be in the library of every naval station and every battleship, so that all who have a taste for the subject may have an opportunity to study it.

The book, as might be expected, abounds in complicated formulas, but the mathematical equipment necessary for reading it is only a good working knowledge of algebra and calculus. Jacobians are so clearly explained in the text that their occasional occurrence will give no trouble.

It need hardly be said, however, that the reading of this book, or any other book, will not make one an expert in probability. Mathematical probability is a difficult subject and requires for its mastery a rare kind of mathematical talent. Experts in probability are few and far between, even among mathematicians. There is no other branch of mathematics in which "the doctors disagree" so frequently.

THE REMAKING OF MODERN ARMIES. By Captain B. H. Liddel Hart. Boston: Little, Brown and Company, 1928. $3.50.

REVIEWED BY BROCKHOLST LIVINGSTON

This latest book from Captain Hart's able pen is of more than casual interest to the naval reader. It could be said that the theme is contained in this statement:

> To save us from the indecisiveness of recent methods of warfare, which inflict permanent injury on the economic life of both sides, we stand in great need of the lightning grasp of the situation, the rapidity of action, and the energy in exploiting the fleeting opportunities of battle, which are the essence of the cavalry spirit.

In his words we find much that may be applied to the realm of naval war, where speed, ever increasing, lends wings to the fleet. In the study of the army's part in mechanization, however, it is the tank and its kin which receive attention. Perhaps not as enthusiastic as some airplane advocates, Captain Hart presents a powerful case for an increasing use of tanks, planes, gas, and other "modern" weapons. In support of his point he quotes Ludendorff who said: "Mass attacks by tanks and artificial fog remained hereafter our most dangerous enemies."

One is forced to question the author's belief that:

> There can be no question that such machines (tankettes or one-man tanks) would endow a landing on a hostile shore—rightly regarded as the most perilous of gambles—with a speed, security, and striking power hitherto unknown. Here again the new form of offense requires no elaborate preparations, no building of special craft from which to disembark them—but, as was proved, any ordinary naval launch will serve.

Granting that the power of these tankettes makes them of value to a landing force—which is undoubtedly the case—is it possible to provide sufficient "ordinary naval launches" to land tankettes in such numbers as will influence the strength of the landing force? Allowing one tankette to each launch, the task seems a gigantic one. In reviewing, we are compelled to remark that there are drawbacks—many of them—to the transportation of these machines on expeditionary work.

Others will question the conclusion that what is termed "The Napoleonic Fallacy" of "absolute war" should be replaced by a new theory stated as: "The aim of a nation in war is, therefore, *to subdue the enemy's will to resist*, with the least possible human and economic loss to itself."

Advising a "moral objective" in place of "the armed forces objective," he believes gas is a means to this end. To substitute a reduction of the will to resist for the past bloodshed is, indeed, a noble wish. However, Hart later describes an airplane attack on England in these terms: "The business localities and Fleet Street wrecked, Whitehall a heap of ruins, the slum districts maddened into the impulse to break loose and maraud. . . . ."

Where, we must ask, would be the improvement in waging war in this fashion? Even the author admits this type of warfare may be objected to for "ethical reasons."

Airplane enthusiasts may well peruse his statement: "In an occupied country, aircraft can control only by threat of destruction,

but land troops by mere grip!" In this he agrees with the findings of our own services.

Because disarmament is such a wayward child, space is devoted to a discourse on the possibilities of accomplishing something towards its reform. One suggestion is offered. "The restoration of war to a professional basis may limit its ravages, as well as retard its outbreak. . . . ." And thus the case for disarmament rests!

A word to those who question France's ambitions is contained in the following:

> I feel that France militarily stands at the parting of the ways. If she continues on her present course her army will soon become a national militia. . . . . I would go farther, and say that far from being a militarist menace, as is the delusion of ignorant foreign pacifists, France today has hardly adequate cover in her military assurance policy, and this security is shrinking to danger-point.

In such a brief review as this we may do no more than attempt to show our readers that this is a book worth studying—for it is that. We live in a mechanical age. Industry strives to replace man power with machines. Why should the art of defense remain satisfied with the ways of the past? No radical steps are urged, but a gradual evolution rather than revolution. Primarily of military interest, there is much in the book which can be read profitably by naval officers and much too that may prove valuable to the statesman.

SHIPS AND CARGOES. By Joseph Leeming. New York: Doubleday, Doran and Company, Inc. 1926. $2.50.

REVIEWED BY LIEUTENANT N. B. MUSSER, *U.S.N.R.*

To no one does the romance of ocean commerce appeal more strongly than to the naval officer, and this is due in part to the fact that the same urge which directs the feet of many of our young men to the Navy, shunts others into the merchant marine, and makes a still larger group scan real or imaginary waves from their office or shop windows with longing eyes and hearts.

Perhaps the strongest reason why naval officers should understand their kindred service, the merchant marine, and become acquainted with civilian mariners, is the fact that both in peace and war they must co-operate and associate with sailors in the hard-running, bread-and-butter-earning fleets of merchant vessels. Furthermore, some of the Navy's ships, such as transports, tankers and freighters, are essentially of merchant types; and in the efficient operation of these vessels officers of the Navy have much to learn from those of the merchant marine.

All of us who have taken long voyages on merchant vessels have felt the need for more sympathy and a better understanding between two services which are so interdependent both in peace and war as are the Navy and the merchant marine.

But the joy of reading that charmingly written and absorbingly instructive volume, *Ships and Cargoes,* would repay anyone for the few hours of leisure devoted to this book, even though no urgent, practical reasons existed for his familiarizing himself with the subject. Who of us, seeing a freighter, a whaler, a tanker, or a great liner hull down upon the horizon, does not thrill and wonder at the living entity passing silently on the heaving waves, bound on one of the world's sea lanes, and doing greatly her part in the world's work?

What type of vessel is she, where is she from, and what will probably be her next port of call? Is she an independent gypsy vessel, or a scheduled link in one of the great merchant fleets of the world? Thinking back we picture the "home office" and the various port organizations which control the movements of these vessels, and thinking ahead we can imagine what distant lands of "palm and pine" our companion for the moment is linking.

Mr. Leeming entertains us in the offices of ship lines and ship brokers, and shows us all of the essential machinery required to control the profitable operation of vessels over the entire globe.

He then carries us to all of the points of origin and of consumption of the various cargoes which form the bulk of the world's ocean trade, and describes briefly the distinguishing characteristics of the many types of vessels which undertake to convey the wealth of the tropics to the temperate zones and return in payment part of the crops and other products of the higher latitudes to the enervating regions near the equator. The descriptions are greatly enhanced by photographs illustrating the various types of vessels and the ports visited.

The book begins with a brief historical review of the adventure of ocean trade from the time of the Phoenicians to the present day. The principal modern sea lanes are then mapped out for us, and the largest merchant fleets of the world are listed and discussed. The operation of these lines and of smaller groups is next described; and a word picture is drawn of two special types of vessels which are of particular interest to naval readers—coal tramps and oil tankers.

After coal and oil, the following great cargoes and the vessels which carry them are considered in their order of importance: grain, ore, lumber, fertilizer, cotton, and rice. Then rubber, coffee, tea, cocoa, sugar, cocoanuts, spices and other products form the subject for the chapter which will appeal most strongly to all of us to whom the "lure of the tropics" has been something more than a catch phrase —an impelling motive to go, see, feel, and know.

The concluding chapter of this entertaining book consists of a general discussion of foreign commerce, with particular reference to the part our nation should play in the future, and the methods which must be employed to insure success in what is without a doubt the most competitive field of business enterprise. In the words of the author, "Geography, foreign languages, shipping terms, and the strange customs of alien peoples, are all taking on a fresh interest and significance as they are recognized as parts of the great problem of world trade, which can only be solved successfully by the nation or individual who knows the moves by heart and plays the game with the greatest knowledge and foresight."

DIESEL AND OIL ENGINEERING HANDBOOK. (Revised Edition.) By Julius Rosebloom. Brooklyn, New York: Industrial Institute, Inc. 1928.

This handbook of 596 pages, generously illustrated and containing many tables, formulas, and questions and answers, is a practical book of instruction and a ready reference guide for Diesel and other classes of oil engines, electric-drive, Diesel geared locomotives and kindred subjects.

The scope of the book is most comprehensive, as may be seen from the following headings: Treatise on Principals; Classification of Characteristics and Operating Phases, Land and Marine Engines, Emergency Repairs, Maneuvering; Comparison of Various Types of Diesel Engines, Design and Installation, Fuel, Valves, Gear Arrangement; Formulas and Tables for Licenses, Indicator Practice, Conversion Tables, Standard Calculation on Main Units, Auxiliaries, Accessories; Fuels, Lubricants and Oil Purification; Oil Engines of Horizontal Construction, Combination Units, Principles, Maintenance; Auxiliaries and Accessories, Cooling Towers, Exhaust Gas Generators, Gears, Flow Meters; Diesel-Electric Drives, Diesel-Electric Locomotives, Diesel Geared Locomotives, Electrical Formulas, Tables; Tools, Welding, Material, Tables; Formulas; Rules Governing American Bureau of Shipping, Lloyd's National Board of Fire Underwriters, Federal Licenses of U. S. Inspectors, Emergencies, Engine Room Log, Maneuvering Signals.

The author has avoided the use of highly technical phraseology but at the same time has managed to give authentic information readily understandable by the layman as well as by the engineer. It is to be noted that the revision is dated March, 1928, and that most of the material has been brought up to date. The inclusion of many tables, formulas, and problems covering all phases of the installation, operation, and repair of Diesel units for marine, stationary, and locomotive drive recommend the book to the buyer and the operator.

W. G.

SPY AND COUNTER-SPY. The Development of Modern Espionage. By Richard Wilmer Rowan. New York: The Viking Press. 1928. $3.50.

REVIEWED BY BROCKHOLST LIVINGSTON

A book such as Mr. Rowan has written is so fascinating in its subject—a subject so necessary both in peace and war—that I wish I might unreservedly recommend it. However, while the book is extremely interesting as fiction, I cannot advise its use as a primer of espionage. Perhaps the author did not intend it as such. Nevertheless, in its contents can be found much that is read easily and yet gives us a proper view of the tasks and needs of modern espionage.

"In time of peace," the writer says,

"espionage is a sort of economical substitute for armed hostilities. But in war the spy is the prince of deadly weapons, the only ancient weapons still in use." And continuing he says:

> So long as there is a navy . . . . that government which neglects Intelligence . . . . on the ground that it is dishonorable, is guilty of folly which will not promote peace and may invite war.

Mr. Rowan knows the truth of what he writes.

The book is conveniently divided into three major subdivisions which deal with "Espionage," "Counter-Espionage," and "Celebrated Secret Agents." The first two parts are of especial interest to naval men. A chapter entitled, "The Spy and His Work," recalls vividly the war-time nightmare of spies. To enlighten those countless thousands whose hysteria made them see in each unaccountable blink of an eye the signal of a secret agent, the author writes:

> Espionage is perhaps but one more of those difficult professions in which, as with acting or writing plays, nearly every one feels designed to achieve an easy distinction, while counter-espionage, the discovery of hostile spies, is the war-fevered indulgence of the millions.

Bringing forth in an able manner the difficulties of communication for the spy, Rowan states that "the spy's great moment of danger comes, not when he is spying, but when he undertakes to transmit whatever information he has been able to secure." And, tracing the various means by which spies have attempted to and at times have succeeded in communicating their information, the author makes the observation that "the communication methods of the future may not be predicted, but it seems certain that they will approach near to the fantastic in their scientific ingenuity."

Much has been written in praise of, and against, women as spies. Their "art" is certainly useful at times but all who know must agree that "a woman, though useful in impromptu spying or in counter-spying, is inadequate as a professional spy under modern conditions of international warfare." And, alongside the account of "Mademoiselle le Docteur," who was a woman spy, we must place the famous Mata-Hari of whom Rowan says: "Mata-Hari was a picturesque figure; but not a great spy." There have been many picturesque figures but not so many great spies among those women who, through patriotic or other motives, have attempted to aid.

One denotes a slight touch of reproof when, in discussing the various secret police forces, the author concludes: "Excepting Russia in the grip of the *Okhrana* or its Bolshevik substitutes, or possibly India under the Mogul emperors, it appears that no country or people has ever required so many spies per capita or suffered such generous official, semi-official, and purely officious espionage as the American nation today." Yet, even with our vast systems so much escapes us!

The writer of this book has dealt with the spies of many nations. In most cases he is unbiased in his thoughts. It is in the case of Germany that he appears to be too critical. Admitting the calamity of such experiences as the barber Ernst whose misstep caused the arrest of himself and twenty-one spies a day after war was declared, the German espionage service did much that was beneficial to the carrying on of the war and bringing victory as near as it so often came to the German arms.

International Newsreel

PRESIDENT-ELECT HOOVER

In admiral's barge in Los Angeles Harbor, as he started on his good-will tour to South America on the U.S.S. *Maryland*.

Distinguished Naval Academy Graduates in Civil Life

Charles Deering

CHARLES DEERING, manufacturer, was born in South Paris, Maine, July 31, 1853. He was graduated at the U. S. Naval Academy in 1873, and thereafter was advanced from midshipman to ensign and master. For seven months he was in China and Japan with General Grant on his tour around the world. In 1881 he resigned from the Navy to enter his father's business, the manufacture of harvesting machinery in Chicago, being successively a member of the firm of William Deering & Company and the Deering Harvester Company, until the merger of the latter with the International Harvester Company in 1902, of which he was Chairman of the Board from 1904 to 1916.

Upon his retirement from active business he gave much of his time to collecting art objects in Sitges, near Barcelona, Spain, where he lived for some years, and to developing his property near Miami, where he experimented with everything that could be grown in that climate. He was, with his brother, James Deering, a great factor in the upbuilding of Southern Florida.

Always a lover of, and a great connoisseur of art, among his most intimate friends were John Singer Sargent and Anders Zorn, and his art collections were notable.

He received the Order of Alfonso XII and Isabel Catolica of Spain; Merite Agricole and Palmes Academiques, France; Nichan Iftikhar, Tunisia, and Double Dragon of China.

He was married (1) 1875 to Annie Rogers Case, daughter of Rear Admiral Augustus Ludlow Case, of Newport, R. I., by whom he had one son, Charles W. Case Deering, who died in 1924. Mrs. Deering died in 1876, and he was married (2) January 2, 1883, to Marion Denison Whipple, daughter of General William Denison Whipple, U.S.A. They had three children, Roger, Marion (wife of Chauncey McCormick), and Barbara (wife of Richard E. Danielson).

He died in his home in Cutler, Miami, Florida, February 5, 1927.

SECRETARY'S NOTES

Dissillusionment

Over one hundred years ago President James Monroe made his famous keynote speech on United States policy. This later became known as the Monroe Doctrine and states that any attempt on the part of European powers to extend their political system in this hemisphere would be considered inimical to our peace and safety. Even in that early day it was evident that the political methods of Europe would not serve this hemisphere if we intended to keep the peace.

The war with Spain brought us into contact with European methods and our control of the Philippines made us deeply interested in the treatment of China after the Boxer Rebellion. Had it not been for John Hay's vigorous pronouncement of the "open-door policy," European governments would undoubtedly have partitioned China. This was in keeping with their spoils systems. We had our eyes opened; we knew what to expect.

When President Wilson went to Versailles in connection with the settlement of the problems of peace after the World War, he found the spoils system in complete control; in fact, while we were bending every effort to win the war, our allies had already allotted territory which strategically belonged to us, if to anybody. Could we expect anything else?

President Harding hoped to accomplish partial disarmament and showed the way in the Washington Conference of 1921-1922. The results ran true to form.

President Coolidge, after seven years of effort to get actual reduction in armaments, finally expresses his thoughts on the matter in his Armistice Day speech. This speech is the reasoned opinion of the man selected by the people of this country to lead the nation. There is no other person who has the sources of information that he has. The country may well pay heed to his words.

History

One of our daily papers commenting on the death of Admiral von Scheer, says: "In the end von Scheer, for all his skill and opportunities, added not a page of victory or defeat, but a technical footnote to history. Today few will recall his name."

That depends upon what country's history is being written. Possibly the English might be glad to erase von Scheer's name from their histories, but they can't. He has been too completely written up by their own historians.

The Germans will certainly keep his name high among the heroes of their country; the man who met a fleet twice as powerful as his own, who inflicted twice the damage on it that he sustained in his own fleet and then boldly drove through the British fleet to the

protection of his own harbors; the man who gave Germany and her allies an additional period of two years in which to try to accomplish their ambition, who jarred the whole British nation, and weakened their faith in their Navy.

The Battle of Jutland involved more forces than have ever been operated in action on the seas in all history, and will form the basis for the study of naval tactics for years to come. Technical, yes; but it was Napoleon's study of the technical aspects of previous campaigns that fitted him to leave his mark on the history of all Europe, and even on the Americas.

Stonewall Jackson left his mark on history; so will Admiral von Scheer. Both fought in a losing cause.

The fleet twenty years ago

On January 7, 1909, the fleet left Suez and started to transit the Suez Canal. In spite of the fact that some of the battleships were larger than any ships that had ever gone through before the trip was made without incident.

The earthquake at Messina, December 28, 1908, broke up the schedule to some extent, as ships were rushed to the relief. Those who visited the scene of the disaster were horrified. The dead were estimated at 200,000. Of course, that included those killed in nearby cities.

In the Mediterranean, the battleship divisions separated and visited various ports in Italy, France, and on the North African coast. The cruise was coming to its end, the impossible was about to be accomplished. From now on, the United States fleet was to be an efficient, cruising organization.

It was a good idea, anyway

Some time ago it was suggested in these notes that a reserve of five billion dollars be put aside, the interest to go towards new construction in the Navy, the principal to be available for national emergency. We see that the same idea is now put out to provide for public works in times of unemployment. We know of no more important public works than the national defense.

"The Pictorial Log of the Cruise"

The response to our request as to the attitude of the members towards the publishing of such a log has been generous. We have enough orders in sight to warrant the Board of Control undertaking the printing, and it will be done. We want to say here that the book will be worth twice the price we are charging, in actual publishing costs. As soon as the February issue is out, we will go ahead. The book should be ready sometime in the latter part of February.

More Coöperation

The members have responded to the call for election of officers wonderfully. More ballots than ever before have come in. In addition, many nominations were submitted. Incidentally, this type of nomination produces more results than any other. Keep sending them in.

Many members sent in gift subscriptions and we appreciate it. We believe the PROCEEDINGS will be welcomed anywhere. One of our members sends in a gift subscription *every month.* He is a real booster.

To those members who have not as yet paid last year's dues we call attention to the fact that the postal regulations require us to stop sending the PROCEEDINGS under such

conditions. Do not let that happen, don't let a little negligence deprive us of your support.

Keep your addresses up to date so that your PROCEEDINGS reach you.

A new idea

One of our associate members has opened up a new project in subscriptions. He wished to send the PROCEEDINGS to a school, in perpetuity. The Board of Control accepted his proposal of buying a subscription in perpetuity for $100. Later this same member sent a subscription in perpetuity to another school.

It is thought that some others in our membership might like to do the same for their "prep" schools or alma maters. The Board of Control will consider such requests. It saves a lot of trouble to those who can spare the money.

They would

We note that the Veterans' Association approves the cruiser program. Naturally, for they have paid the price of unpreparedness. The ones who have to do the fighting want to be ready; those who have done the fighting, do not want their children to go through what they went through. Why not pay attention to them rather than to those who preach pacifism and decry patriotism?

The "Maryland" and the good-will visit

Some people take exception to the President-elect going on his mission of good will in the battleship *Maryland*. Why? Did they oppose our destroyers rescuing the Greeks in Asia Minor; did they object to our warships rushing to Japan in her hour of trouble; did they object to our battleships rendering aid to Messina twenty years ago; did they object to the *Wyoming's* going to the aid of the *Vestris?*

The trip of the *Maryland* is quite in keeping with the record of the Navy in good-will missions.

Going down to the sea in ships

The tragedy of the *Vestris* recalls forcibly the need for stern discipline at sea. The sea is a hard taskmaster and demands strict adherence to the laws of the sea that have been handed down through the centuries.

Many persons have thought that the captain of a ship exercises too great a power over the lives of those under him. Although the investigation of the sinking of the *Vestris* discloses many opposed opinions and conflicting testimony, one thing seems certain at this time, namely, if the proper discipline had been maintained, many lives would have been saved. Imagine an officer in a lifeboat allowing members of the crew of the boat to take command! Such mutinous conduct should have been treated as mutinies on the high seas have been treated for centuries.

The report of the General Board

The report of the General Board which was published in November, 1928, is a clear and concise statement of the purposes and needs of the United States Navy. Certainly, no one can say that the Board resorts to subterfuge.

We imagine that some of our large industrial organizations would be pleased to have such a clear report from their boards of directors.

The inferiority complex

Recently one of our clergymen, speaking in London, went out of his way to deprecate this country's effort in the World War. It would seem that it is unnecessary for us to tell Europe how little we did to win the war; they have been telling us that for some time. In fact, they have almost hypnotized themselves into believing that we started the war and should pay for it.

Anyway this speaker spoke one great truth when he said our troop transport was only possible on account of the British fleet. But why should our troop transport be dependent on the good will of Great Britain? Should we not be able to handle our own affairs? Why shouldn't we have a Navy sufficient for our needs?

Our new book on international law

The 1928 revised edition of Soule and McCauley's *International Law* is now out. For those who do not know about it, the book is a compact compilation of the latest thought on international law. It is prepared for the use of midshipmen but we recommend it to all seagoing persons. It has a sturdy binding, is printed on fine paper and with excellent type. It costs $2.00, postpaid, ten per cent less to regular and associate members. It is useful for officers preparing for examinations and should be in the library of every ship that goes to sea.

Kind words

We have received quite a number of letters complimenting the Institute on its PROCEEDINGS. Below we are quoting one of the very nicest.

"I am enclosing a money order for six dollars, three of which will pay my dues for 1929, and the other three the dues of my brother to whom I present the PROCEEDINGS as a welcome Christmas present.

"I can't tell how greatly I enjoy and value the PROCEEDINGS. I feel always that I can believe what I read in its pages, and to have such an authority to keep me straight in the muddle of opinions and haphazard reports appearing in the public print is a great comfort in itself. I consider it the best of all the magazines which come into the house—the best and the most reliable. Articles appearing even in standard magazines under the signatures of experts, for example, have me wondering very often just why they were written and published. But the PROCEEDINGS invariably impress me as being professional, simple, and by that I mean unsensational, and always well arranged. The recent article about the battles for Belleau Woods is an example of what I mean. I have read a good deal about that famous encounter, but that article gave a very exact idea of what occurred.

"It may be that I give the PROCEEDINGS more than its proper due. But I don't believe so. I'm sure a great deal of thought and care underlie its editing, and that must be the secret of its excellence. Really, I value it highly."

Check

We stand corrected! In the December issue, plate XLII, we showed a picture of three planes, flying upside down in formation and credited the evolution to the Army. These were Navy planes, flown by the "Three Sea Hawks." It was a marvelous stunt anyway.

FEB 1 1929

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February, 1929

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The pages of the PROCEEDINGS, of which this issue is a fair sample, cover a wide range of interesting subjects, accompanied by beautiful illustrations, pertaining to the sea. The contributors, both foreign and American, officers and civilians, many of whom are distinguished in their specialties, so write as to interest both the associate and regular members as well as lay readers. In addition to the leading articles in the main body of the magazine, there are departments under the following headings: Discussions, Professional Notes, Notes on International Affairs, Book Reviews, and Secretary's Notes. For further information address Secretary-Treasurer.

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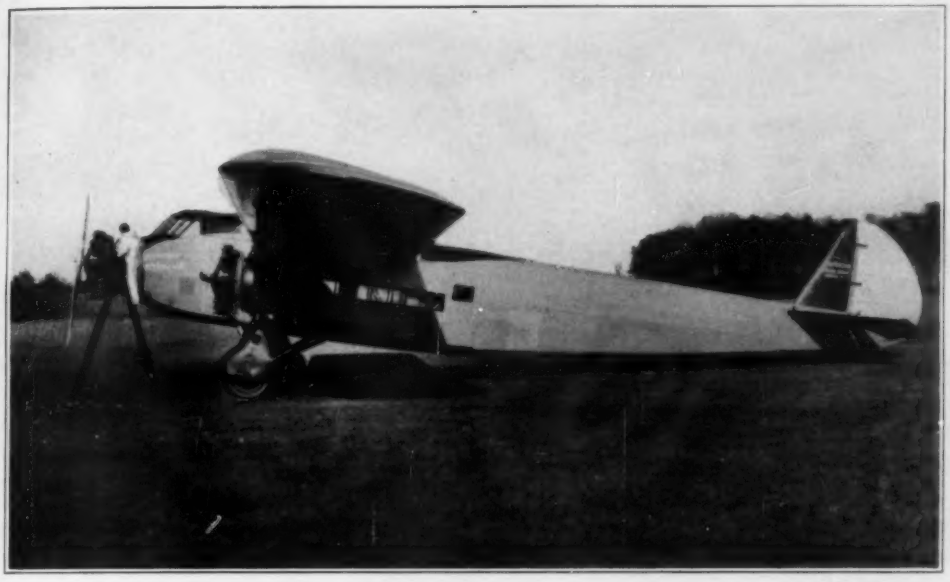

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A PRIZE NOT TO EXCEED FIVE HUNDRED DOLLARS WITH A GOLD MEDAL, and a life membership in the Institute (unless the author is already a life member, in which case he will receive the commuted value thereof), is offered by the Naval Institute for the best essay submitted on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award of the prize to be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay to the Secretary-Treasurer in a sealed envelope marked "Prize Essay Contest." The name of the writer shall not appear on the essay, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary-Treasurer, with the motto on the outside and the writer's name and motto inside. This envelope will not be opened until after the decision of the board. Essays must be received on or before January 1, 1930.

3. In addition to the "Naval Institute Prize," one or more essays may receive "Honorable Mention," if of sufficient merit to justify that award; or, in the event that no essay is adjudged of sufficient merit to receive the "Prize," the best essay submitted may receive "Honorable Mention" in lieu thereof.

4. In case one or more essays receive "Honorable Mention" the writers thereof will each receive a prize, the amount of such awards to be decided by the Board of Control in each case.

5. Announcement of awards will be made as soon as practicable after January 1, 1930.

6. Essays awarded the "Naval Institute Prize" or "Honorable Mention" will be published in the NAVAL INSTITUTE PROCEEDINGS as soon as practicable. Essays not awarded a prize may be published at the discretion of the Board of Control, and the writers of such articles shall be compensated at the established rate for articles not submitted in competition.

7. Articles shall be limited to eleven (11) printed pages in the PROCEEDINGS (approximately 8,000 words), but shorter articles will receive equal consideration.

8. In event of the prize being awarded to the winner of a previous year, a gold clasp suitably engraved will be given in lieu of the medal.

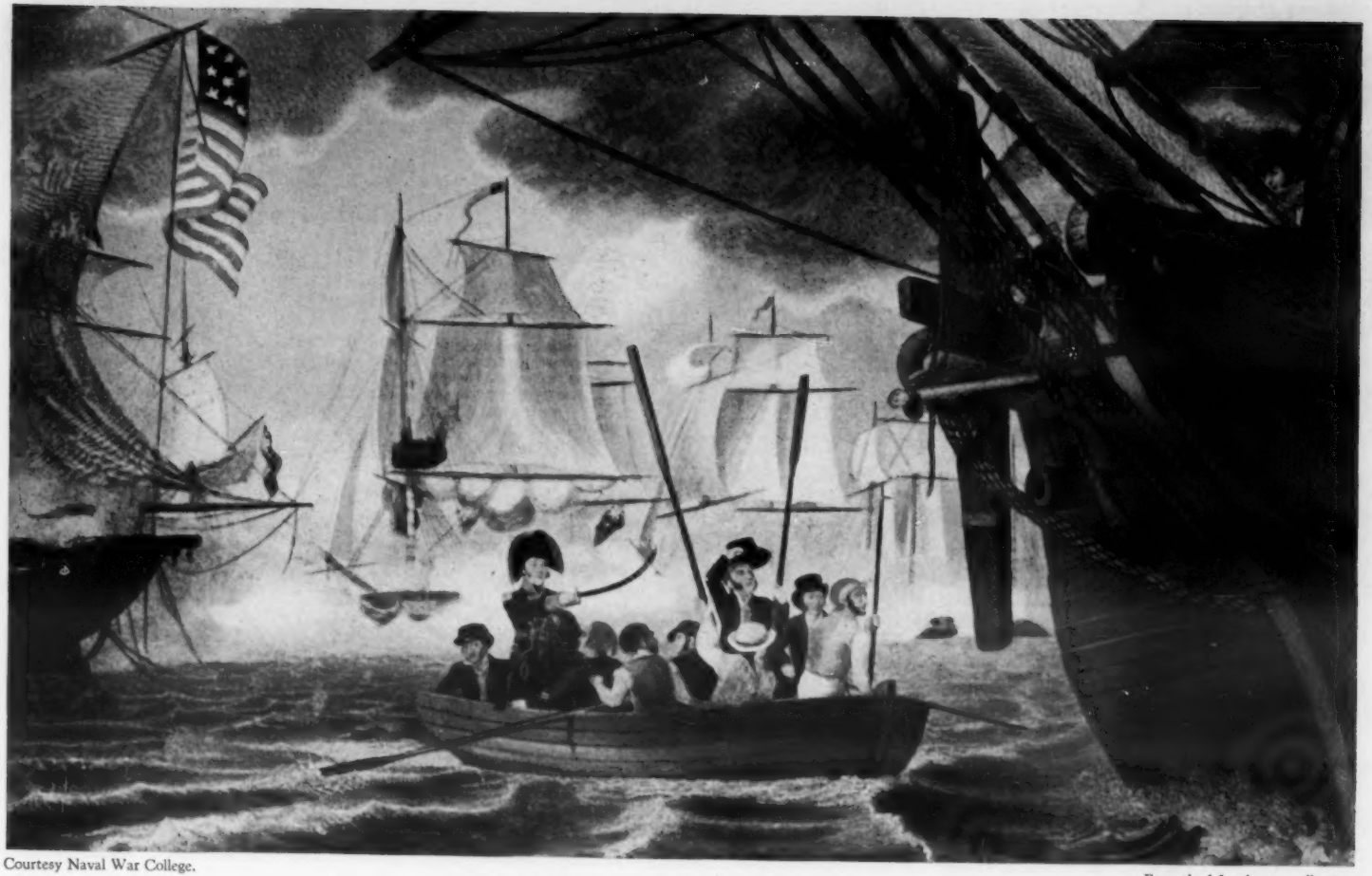
9. All essays must be typewritten, double spaced, and submitted in duplicate.

R. C. MACFALL
Captain, U.S.N., Secretary-Treasurer

Huestis P. Cook, Richmond, Virginia

GEORGE WASHINGTON, BY HOUDON

This statue stands in the main entrance of the state capitol at Richmond, Virginia. It was made from life and is life size. The statue was approved by General Washington some seven years before his death.



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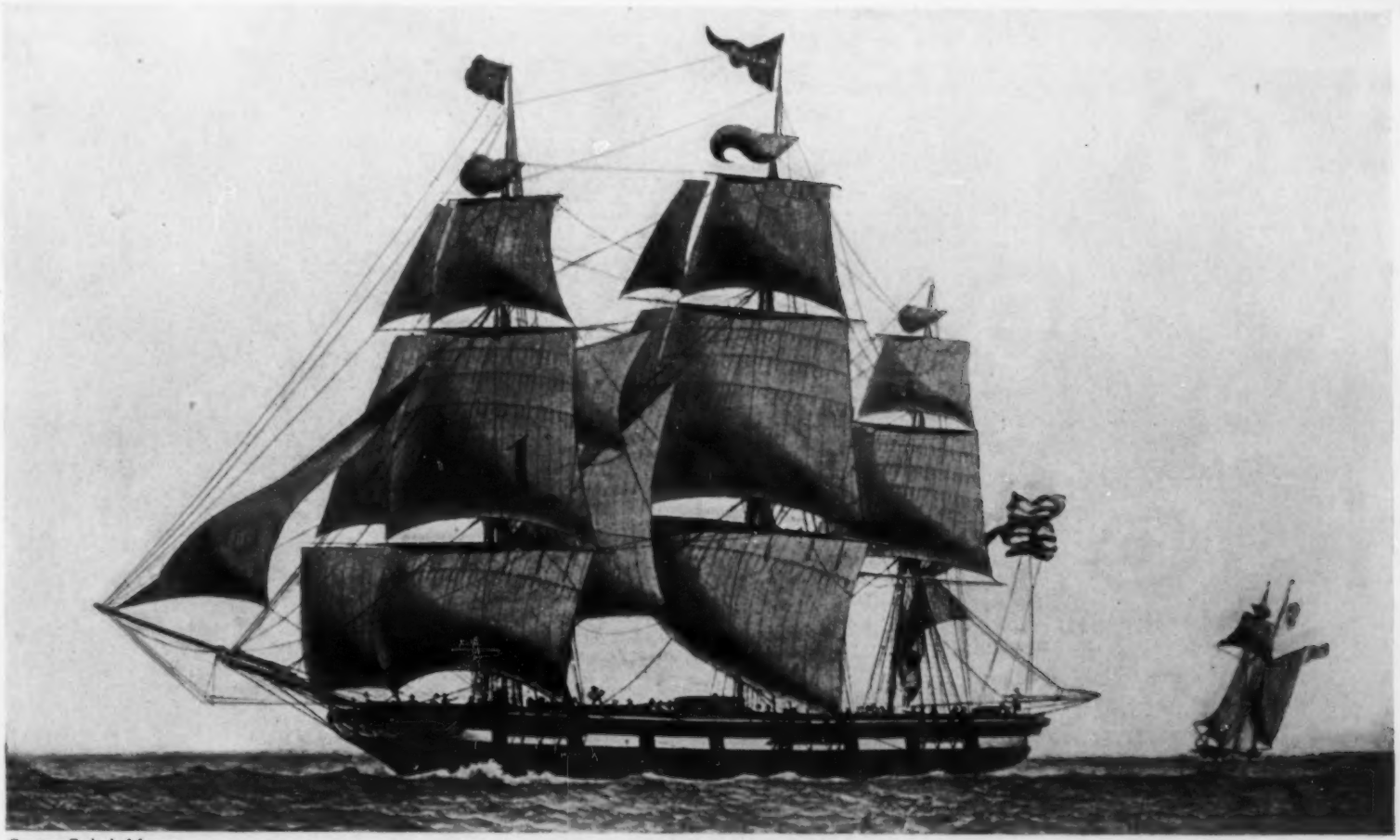
PERRY'S VICTORY ON LAKE ERIE, SEPTEMBER 10, 1813
(From an engraving by Lawson after painting by T. Birch)

(From an engraving by Lawson after painting by T. Birch)



Courtesy Peabody Museum

AMERICAN PACKET SHIP *COMMODORE PERRY*
(From the painting by Antoine Roux, Jr., owned by Mr. Charles H. Taylor.)

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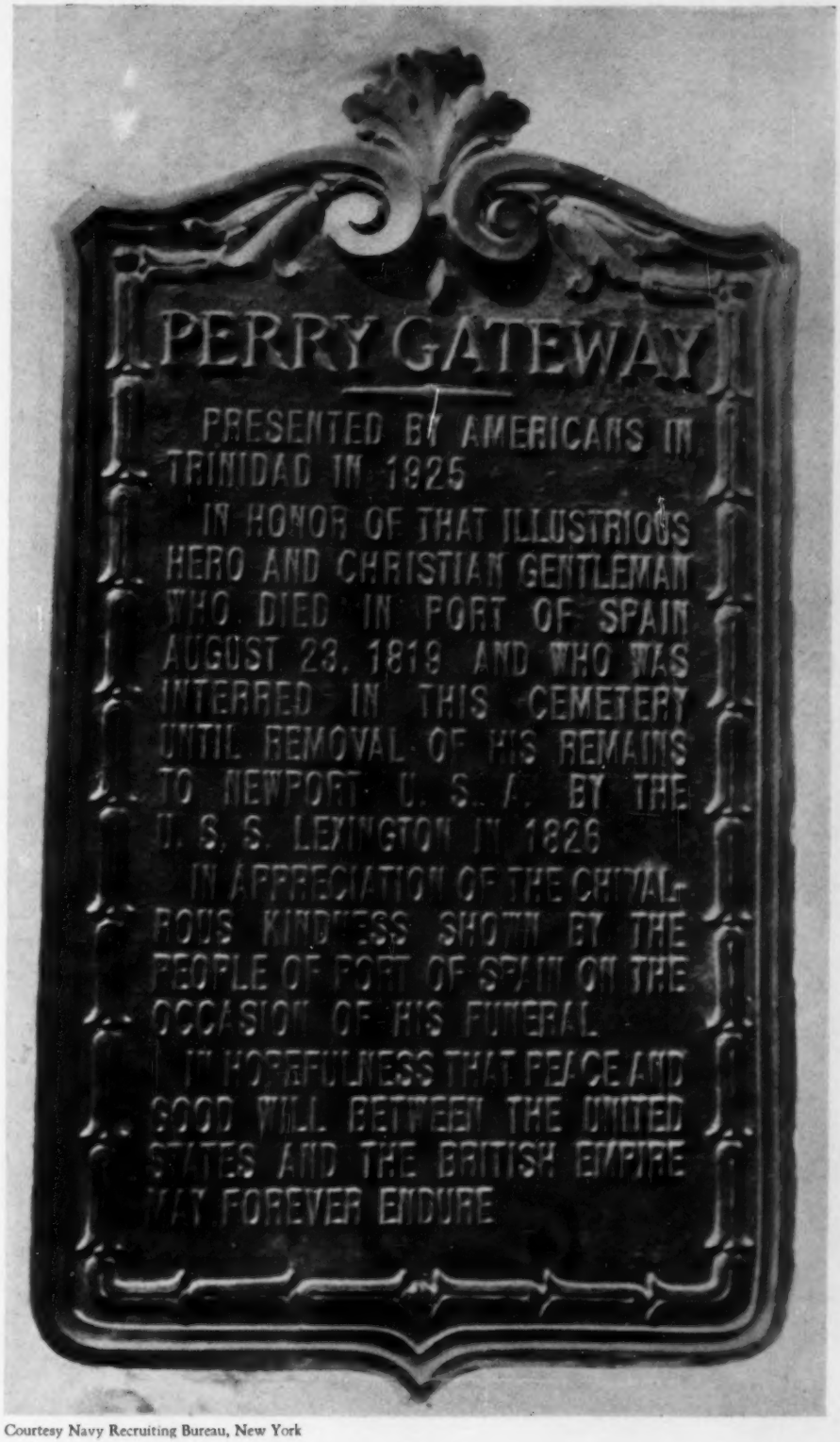
PERRY GATEWAY
PRESENTED BY AMERICANS IN TRINIDAD IN 1925
IN HONOR OF THAT ILLUSTRIOUS HERO AND CHRISTIAN GENTLEMAN WHO DIED IN PORT OF SPAIN AUGUST 23. 1819 AND WHO WAS INTERRED IN THIS CEMETERY UNTIL REMOVAL OF HIS REMAINS TO NEWPORT U. S. A. BY THE U. S. S. LEXINGTON IN 1826
IN APPRECIATION OF THE CHIVALROUS KINDNESS SHOWN BY THE PEOPLE OF PORT OF SPAIN ON THE OCCASION OF HIS FUNERAL
IN HOPEFULNESS THAT PEACE AND GOOD WILL BETWEEN THE UNITED STATES AND THE BRITISH EMPIRE MAY FOREVER ENDURE

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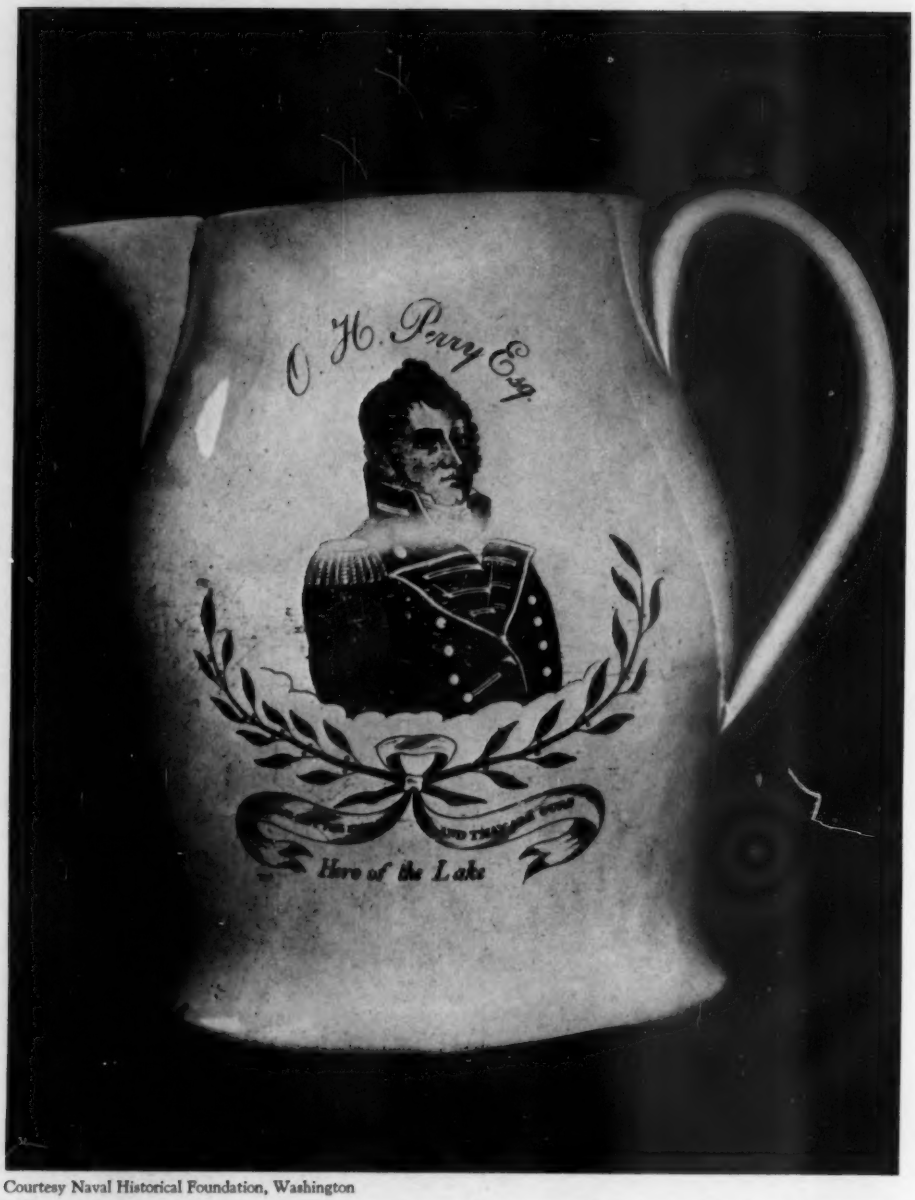

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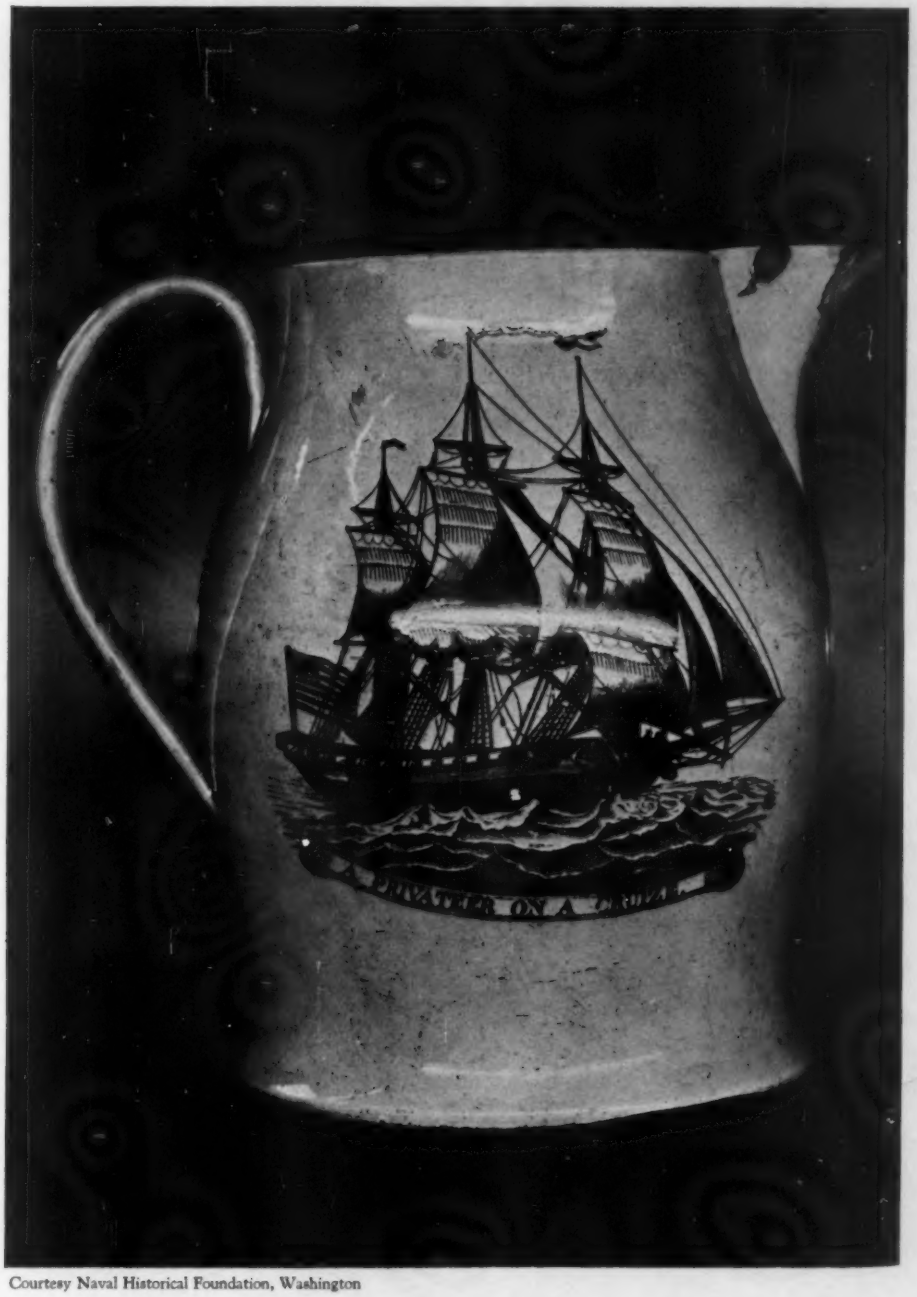

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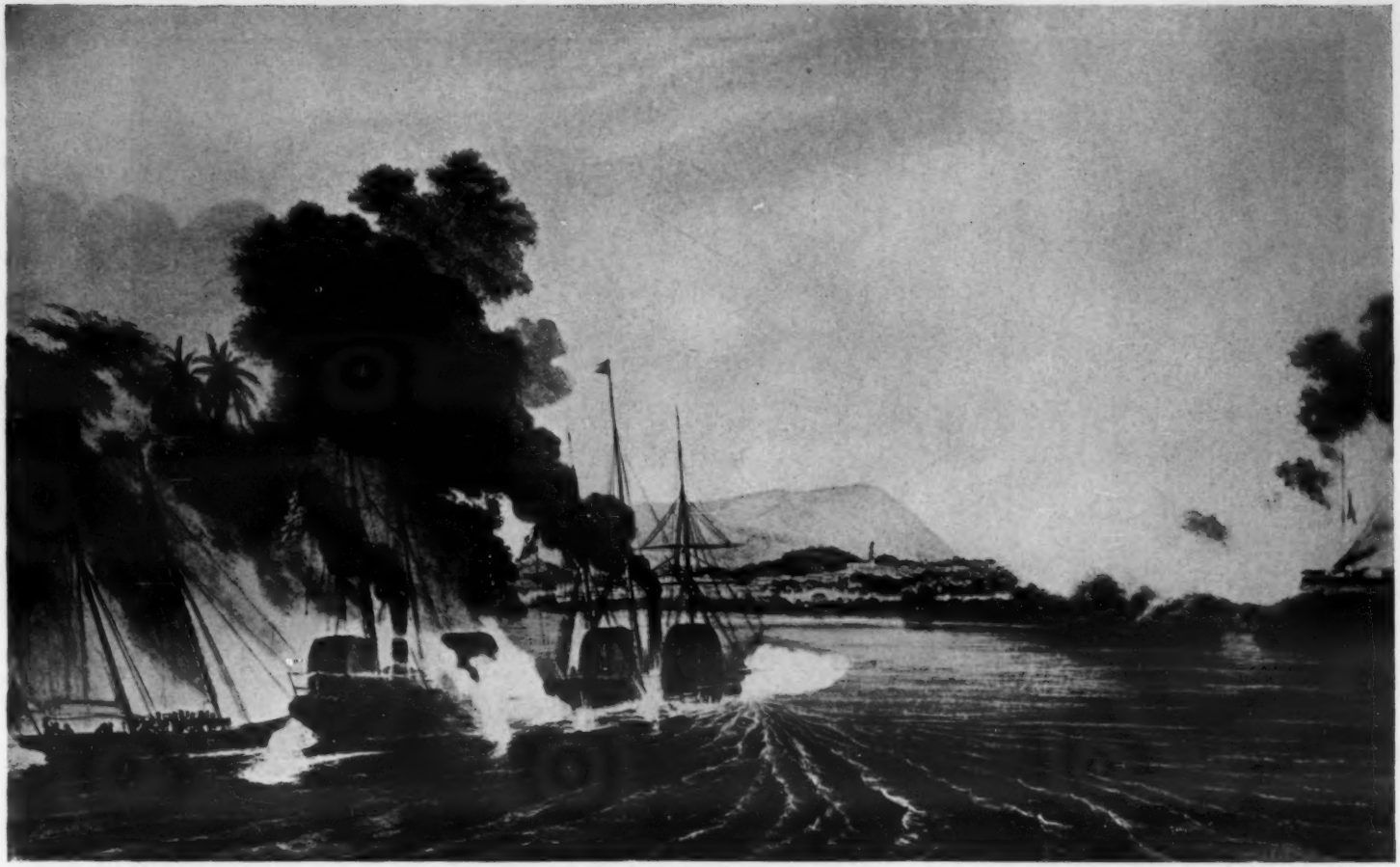

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THE CAPTURE OF TABASCO, MEXICO

Captured by U.S. Naval Expedition under Commodore M. C. Perry, 1847. Matthew C. Perry was a younger brother of Oliver Hazard Perry.
(Original Lithograph by Lieut. H. Walke, U.S.N.)

Commodore Oliver Hazard Perry

LAKE ERIE

1780-1819

(From the portrait by Jarvis)

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